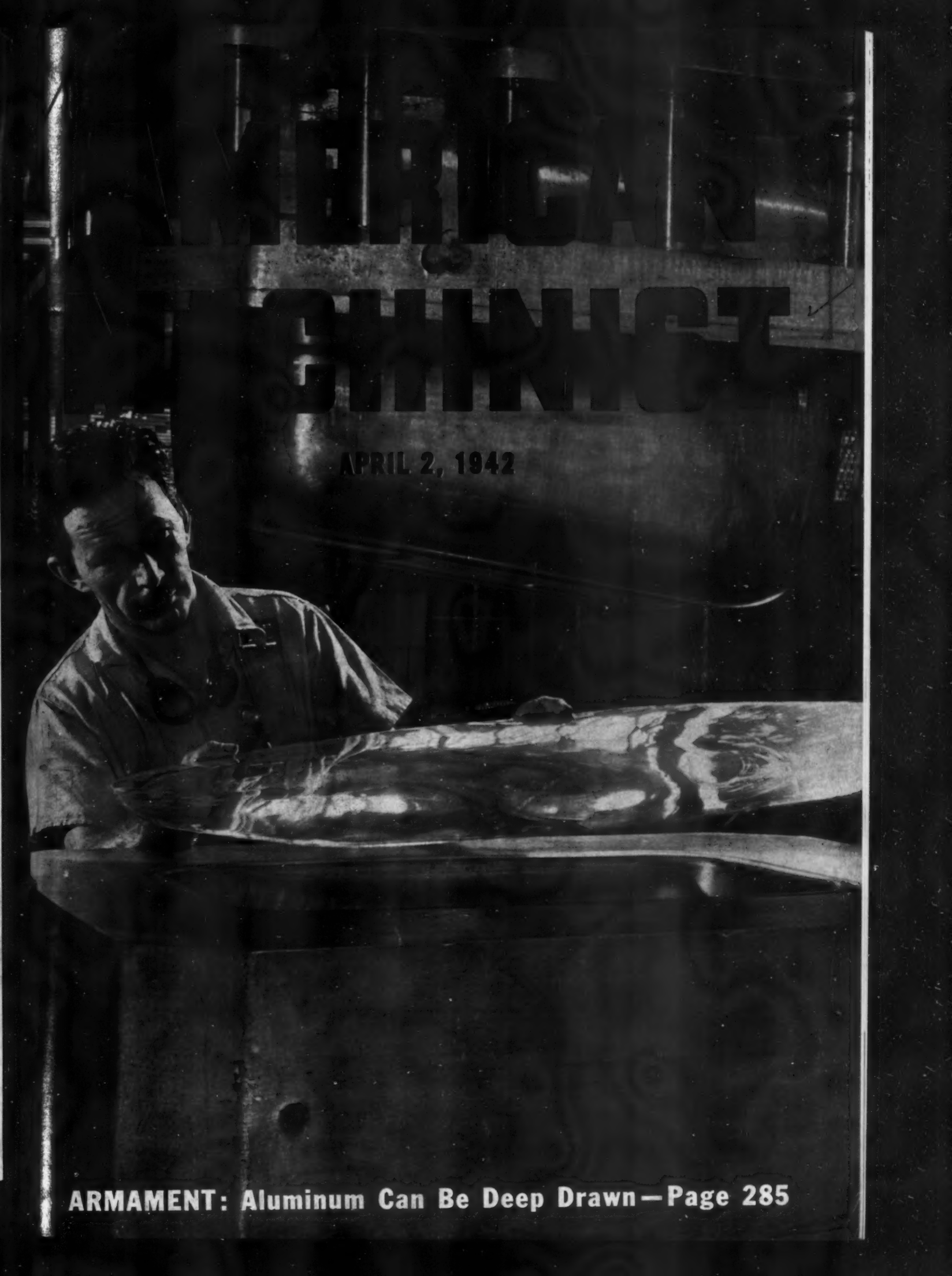

ARMAMENT: Aluminum Can Be Deep Drawn—Page 285

LODGE and SHIPLEY Put Airplane Quality Into Their Products

TODAY almost the entire Heald output of Bore-Matics is being used for precision finishing scores of parts for airplane engines to obtain the ultimate in accuracy and finish together with maximum production.

Four years ago while Lodge and Shipley were seeking similar quality for their lathes they also selected a Heald Bore-Matic. They tried it out on headstocks and tailstocks and the results, particularly in regard to alignment, were so satisfactory that they secured additional Heald Bore-Matics for numerous other parts such as control boxes, carriage aprons, quick change boxes, lead screw brackets, etc. Today these lathes are not only being built better, but what is more essential, faster than ever before, and in turn are being chosen to machine airplane parts since "Quality can best produce Quality."

If you have work that requires precision finishing let our engineers look over your problem and give you unbiased first hand information on how it can best be handled.

THE HEALD MACHINE CO., WORCESTER, MASS., U. S. A.

AMERICAN MACHINIST

April 2, 1942

Formed for Flying — A sheet of aluminum is placed between dies to become a deep-drawn aircraft part

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MAJOR ARTICLES

How We Subcontract ..... *George P. Longabaugh* 271
How to Use Abrasive Cutting ..... *H. G. Robinson* 275
Measuring Gear Tooth Thickness ..... *Clyde A. Young* 278
Boring Bars, Pilots, Special Tools ..... *John G. Jergens* 280
Training for the Future ..... *Fred A. Firnhaber* 282
Welding Stainless Pressure Vessels ..... *G. H. Sandberg* 293
Heat-Treating Jacks 296

ARMAMENT SECTION

Aluminum Can Be Deep Drawn ..... *Charles C. Misfeldt* 285
Making the Bren Breech Block 290

SHORT ARTICLES

A Veteran Returns to Service ..... *Arthur Havens* 274
Uses of Sintered Silver Increasing 295

IDEAS FROM PRACTICAL MEN

Bench Tool Cuts Bar Stock ..... *A. K. Baker* 298
How to Use Short Tool Bits ..... *George J. Murdock* 298
Index Bases Speed Milling Operations ..... *Frank Hartley* 298
Truing Worn Tool Rests ..... *Laurence F. Southwick* 299
Cam Milling With a Radial Drill Press ..... *B. K. Arthur* 300
Tool Bit Clamp Reduces Grinding ..... *Martin H. Ball* 300

NEWS OF THE INDUSTRY

Gaging Business 304b
Inside Detroit 304g
War Orders in Brief .. 304h
Wartime Washington .. 304i
Names in the News ... 304k
Obituaries 304l

DEPARTMENTS

What's in This Issue .. 57
Reference Book Sheet .. 301
Editorial 304a
Shop Equipment News . 305
New Materials 318
Trade Publications 319
New Books 320
To the Editor 320

NEW 3 BIG HANDBOOKS for MUNITIONS MAKERS

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This is the new *American Machinist* "Shell Book" . . . double the size of the original volume, but still priced at only $1 postpaid. A full 250 pages of the latest authoritative information on making artillery and small-arms ammunition. Covers bullets, shot, shell, cartridge cases and clips. Combines all the best of Arsenal, private-plant and Canadian ammunition practice . . . equal in scope to a 750-page text book. Among the subjects covered —

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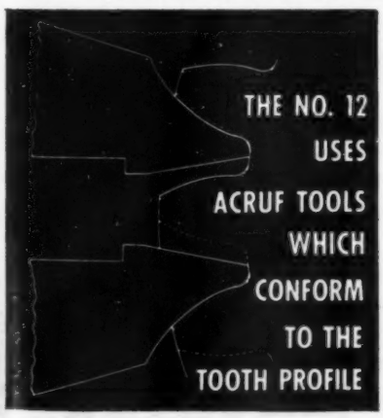
GLEASON NO. 12 TWO-TOOL ROUGHER

With the new No. 12 Rougher, fast and extremely close roughing is extended to straight bevel gears and pinions, both in the smaller lot quantities and with front hubs.

The No. 12 operates without generating roll and uses new Acruf tools which leave only a small amount of stock over the entire tooth surface to be removed in finishing. With minor changes in the cycle of the finishing machine, a better tooth finish at savings in finishing time from 35 to 50 per cent is obtained on gears which have been Acrufed on the No. 12.



Send prints together with quantity requirements for complete information on how this new Rougher can reduce your gear cutting costs.

SPECIFICATIONS

Maximum Pitch Diameter	**18″**
Ratios	**1-1 to 10-1**
Coarsest Pitch	**4 D.P.**
Maximum Face Width	**2½″**
Index Range	**5 to 200 teeth**
Floor Space	**63″ x 89″**

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

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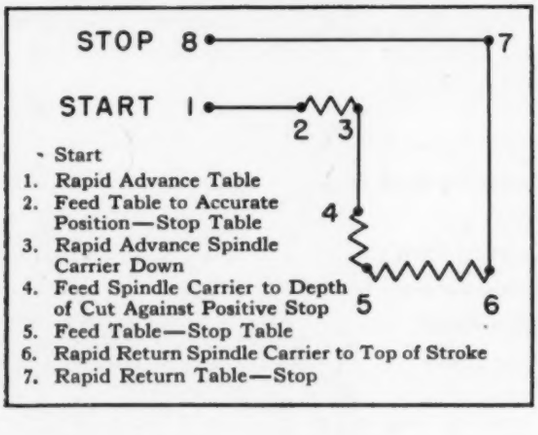
Meet the

OF THE AUTOMATIC FEED



Start
1. Rapid Advance Table
2. Feed Table to Accurate Position—Stop Table
3. Rapid Advance Spindle Carrier Down
4. Feed Spindle Carrier to Depth of Cut Against Positive Stop
5. Feed Table—Stop Table
6. Rapid Return Spindle Carrier to Top of Stroke
7. Rapid Return Table—Stop

In this operation . . . milling a groove in a gun locking device . . . the CINCINNATI No. 0-8 with Rise and Fall Spindle Carrier is employed because it is not possible for the table to traverse directly into cut. Operating cycle diagram for this milling operation is shown at the left.

SAVE *with a Cincinnati!*

THE CINCINNATI MILLING MACHINE CO.

Cincinnati, Ohio U. S. A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES
SURFACE BROACHING MACHINES • CUTTER SHARPENING MACHINES

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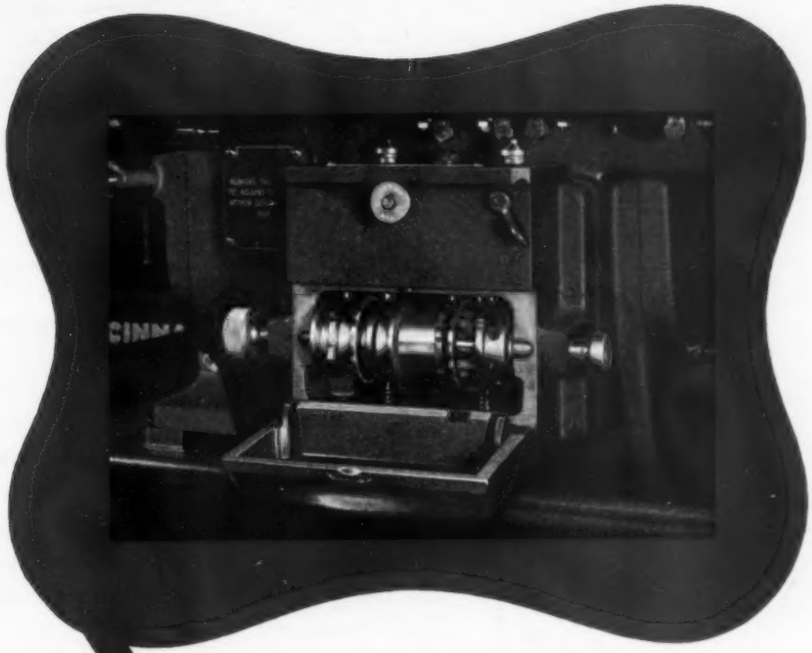
D CYCLES

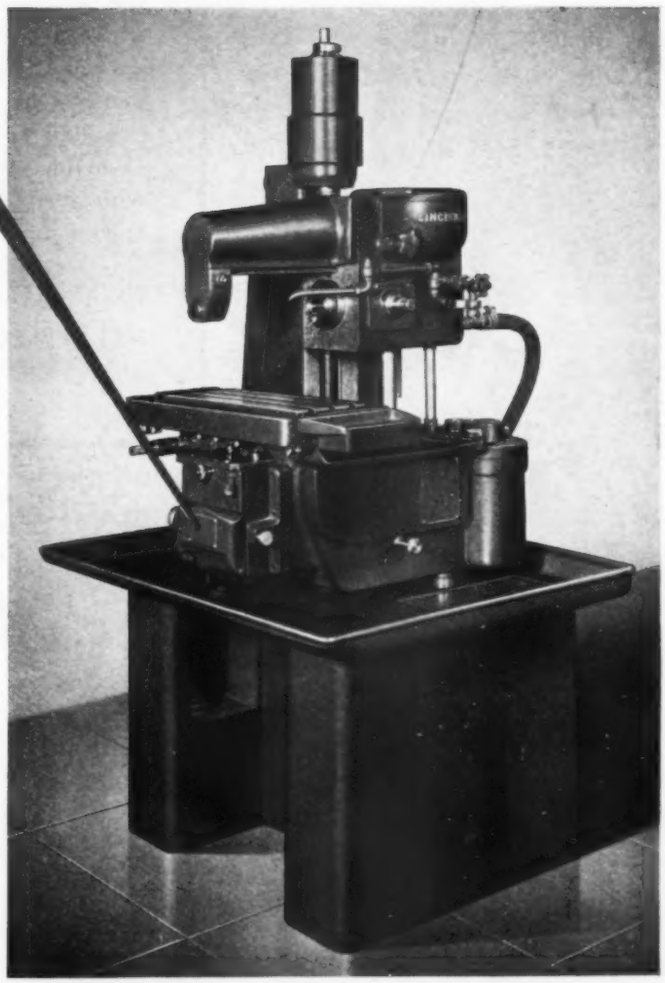
CINCINNATI



This camshaft assembly is, unquestionably, the "boss" of the automatic feed cycles of the CINCINNATI No. 0-8 Plain Automatic Milling Machine.

It fully controls the feed cycles of the table as well as the rise and fall movement of the spindle carrier and directs the machine through every operating cycle automatically. The "boss" or cycle selector (illustrated at upper right with door open to show mechanism) consists of a small hydraulic valve block, actuated by the dogs under the front ledge of the table. By using different cycle selectors, each arranged for a predetermined cycle of operations, a great number of useful operating cycles are made available. This flexibility makes the CINCINNATI No. 0-8 an extremely versatile machine, capable of milling a wide variety of small parts fast, accurately and economically. When equipped with the Rise and Fall Spindle Carrier the No. 0-8 is especially useful for milling blind cuts. A good example of how these functions are coordinated in the No. 0-8 is shown in the illustration on the opposite page.

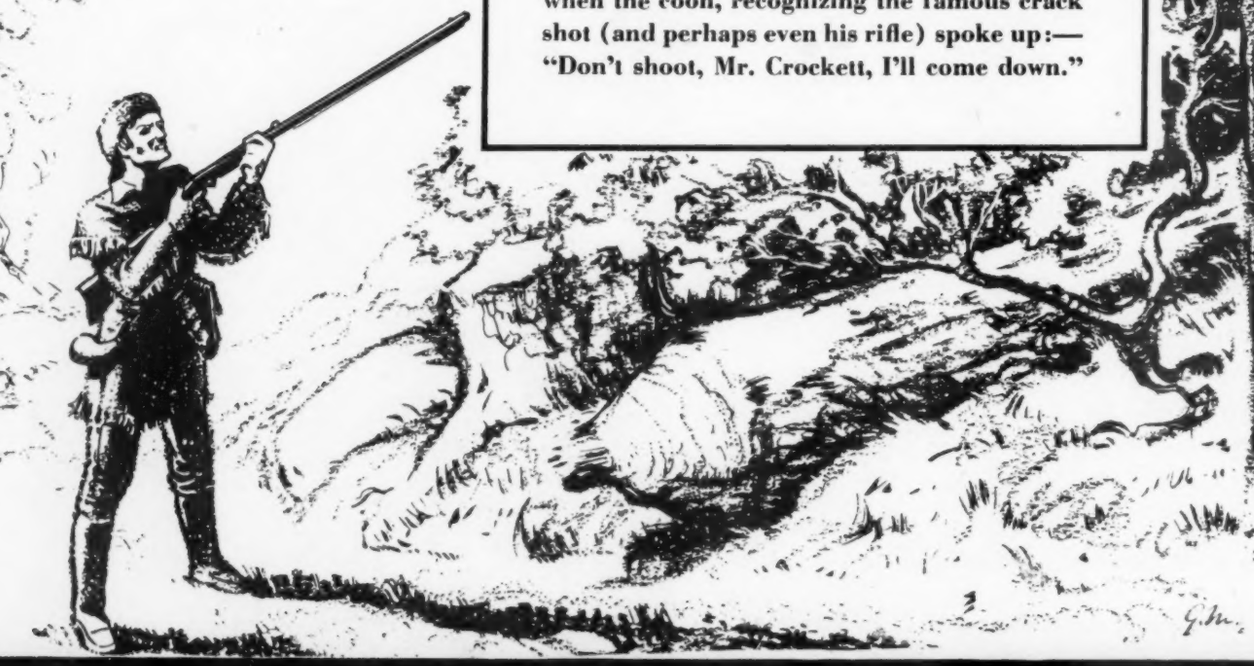
Changing from one cycle to another is a comparatively simple procedure. Actually it requires not more than a minute or two to remove one cycle selector and replace with another. Furthermore, you don't need a toolmaker nor do you have to depend entirely upon the operator because the machine is completely automatic. Load the fixture—flip the starting lever and the No. 0-8 does the rest.

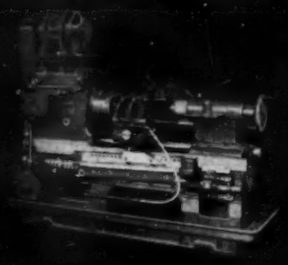


If you are looking for a milling machine to handle small parts fast, accurately and economically, the answer is a CINCINNATI No. 0-8 Plain Automatic Milling Machine. Specification catalog M-964 covers complete details on all features and their benefits. A copy of this book is yours for the asking.

"Don't shoot, Mr. Crockett

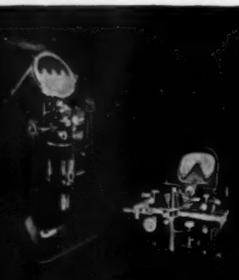
This country was explored, staked out, settled and defended by men with firearms in their hands. By the time of Texas independence gunsmithing had developed from the trade of the armorer into a much more specialized and refined skill. First to make guns of a degree of precision permitting the interchange of parts were the gunsmiths of the old National Hydraulic Company from which Jones & Lamson traces its industrial ancestry. These superior rifles were in great demand on the frontier and many were supplied to the "Lone Star Republic." A favorite Vermont story of the times deals with the famous frontiersman and patriot, Davy Crockett. One day, armed with his rifle, Crockett had drawn a bead on a treed coon when the coon, recognizing the famous crack shot (and perhaps even his rifle) spoke up:— "Don't shoot, Mr. Crockett, I'll come down."





FAY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS

AUTOMATIC OPENING DIE HEADS

. . . I'll come down"

HERE in this community the ancient craft of shaping metal first developed modern precision. Because the times demanded better firearms this skill was promptly and earnestly applied to the rifle . . . the one indispensable tool of the pioneer.

But more was accomplished than the making of better guns . . . more was brought down than Davy Crockett's coon. This improved technique literally began the career of the modern high-grade machinist and toolmaker. And from the skill gained in making weapons of destruction came the civilizing force of modern machine tool production.

Today this skill and ingenuity plus all that science and the years can teach are devoted, not only to meeting the needs of industry in time of war, but to anticipating the country's wants in the years ahead . . . when the forces of destruction shall be made to serve the needs of peace.

Here at Jones & Lamson inquiries from large or small companies receive the careful, detailed study of our engineers. Send your questions to us now and ask for our illustrated catalogs.

JONES & LAMSON
MACHINE COMPANY

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

Springfield, Vermont
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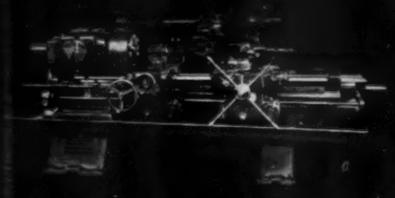
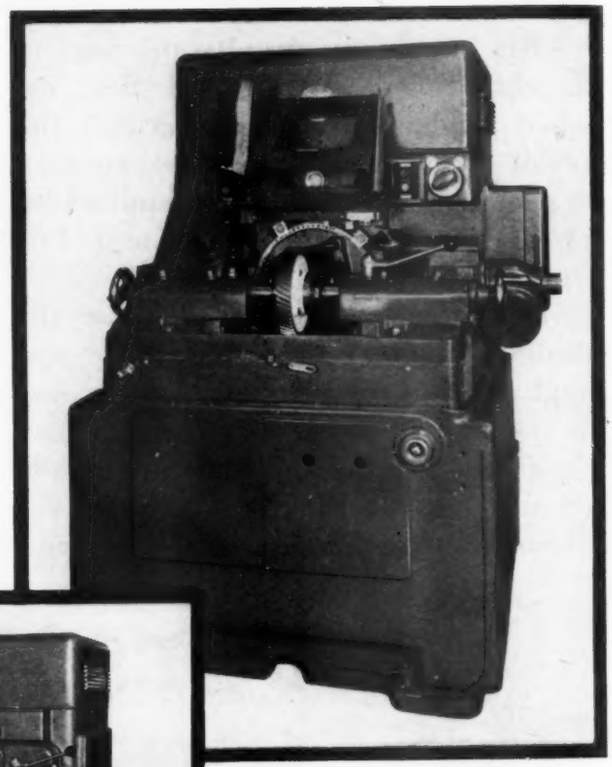
PROFIT PRODUCING
MACHINE TOOLS

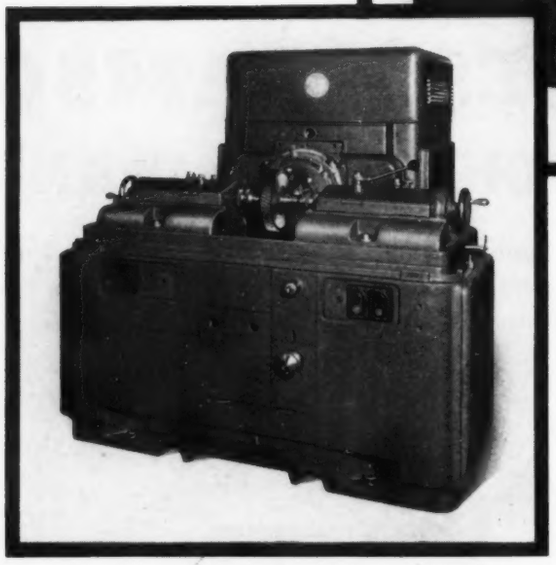


SADDLE TYPE
UNIVERSAL TURRET LATHE

RAM TYPE
UNIVERSAL TURRET LATHE

Presenting





The new No. 12 Fellows Gear Finishing Machine shown above is of massive construction, and rigidly supports both the finishing tool and work.

The machine at the left is the new No. 24, built along similar lines to the No. 18, which has also been redesigned.

FELLOWS

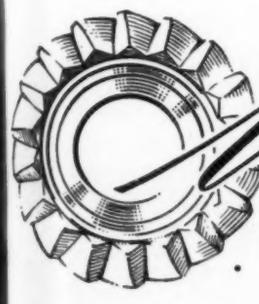
MACHINES AND TOOLS FOR GEAR PRODUCTION

GEAR FINISHING MACHINE

Improvements

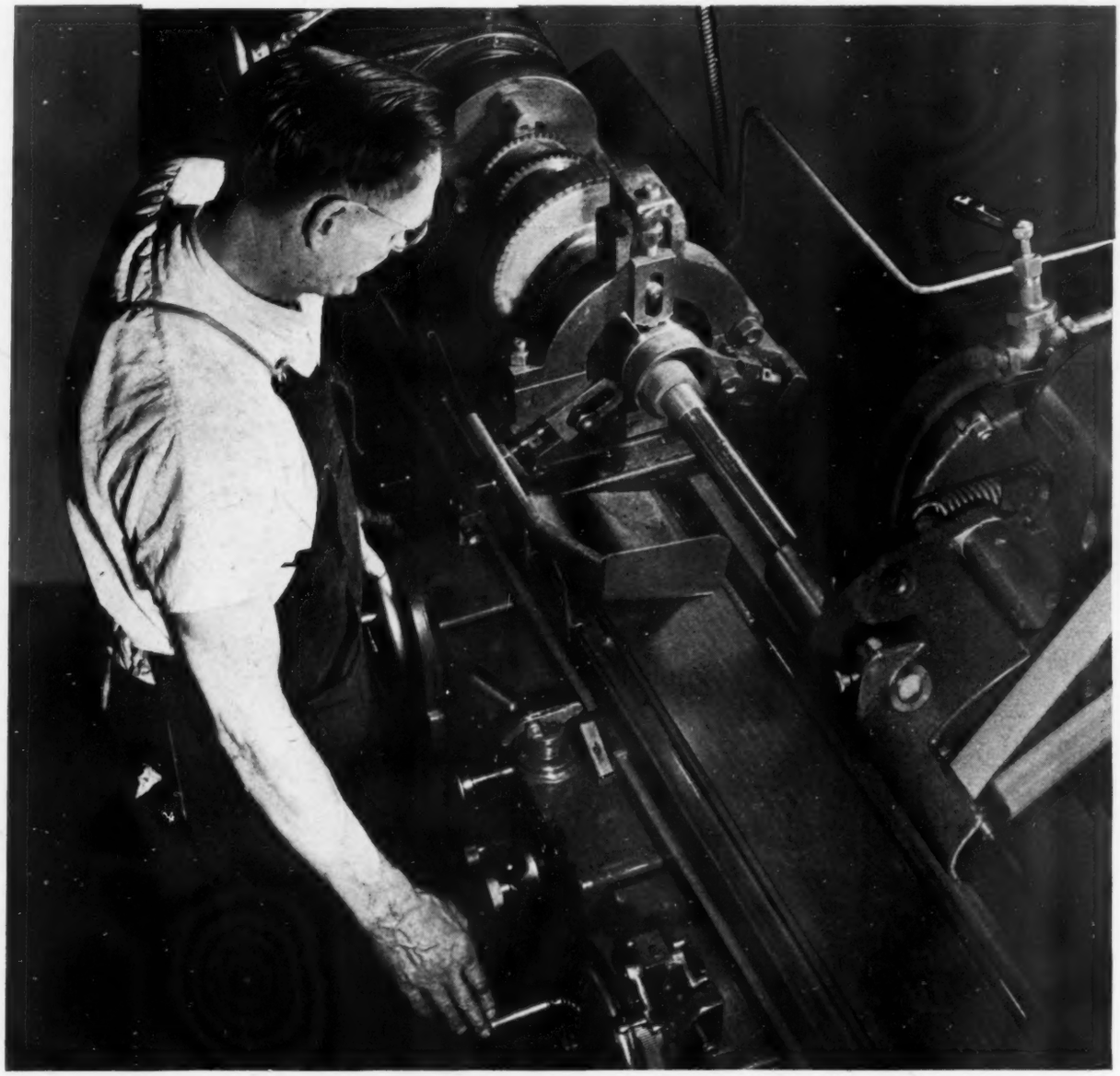
1. Two New Fellows Gear Finishing Machines
2. New Tool Traverse Stroke Control
3. New Adjustable Time-controlled Reversal at Ends of Stroke
4. New Synchronized Depth Feed Mechanism
5. Push-button, and Full Automatic Electrical Control
6. Supreme Rigidity for Controlled Accuracy
7. Fellows Precision Tooling

Fellows introduces two new Gear Finishing Machines for finishing spur and helical gears, and having maximum capacities of 12 and 24 inches, respectively. These machines incorporate many new features in design and operation, as briefly outlined in the above tabulation. These improvements not only contribute to still more closely controlled accuracy, but add operating conveniences of notable importance. For new descriptive circulars write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, of 640 West Town Office Building, Chicago.



Method

. . . . FROM BLANK TO FINISHED GEAR



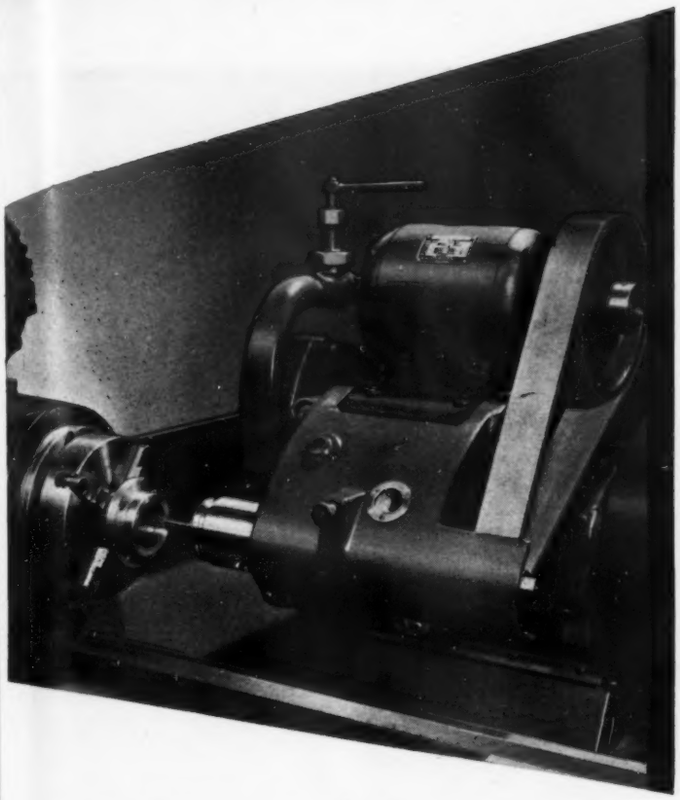
In in and outer

SAVE *with a Cincinnati!*

CINCINNATI GRINDERS INCORPORATED

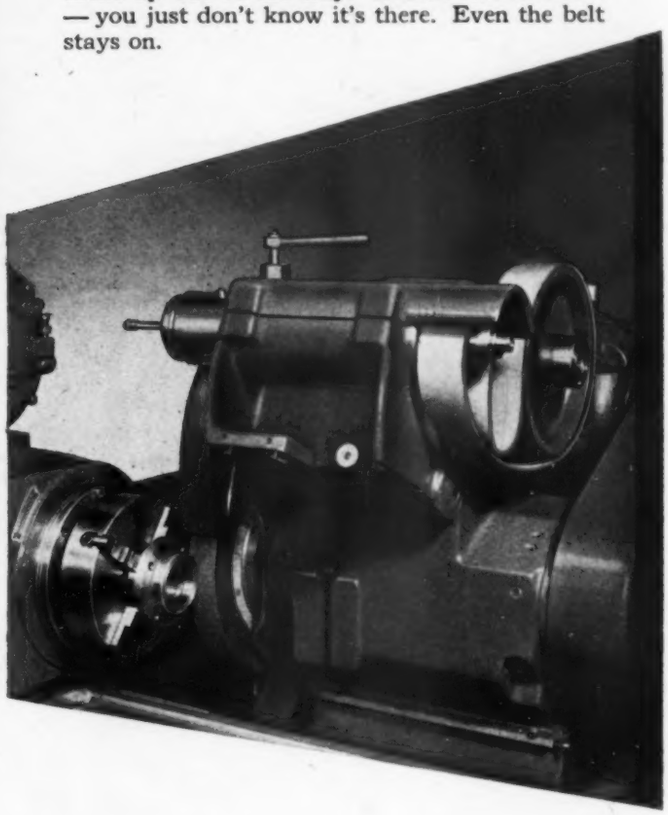
Cincinnati, Ohio U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES



For Internal Grinding: Swing Internal Attachment down — tighten one hold-down bolt and it's ready. Takes less than a minute.

For External Grinding: Swing Internal Attachment up out of the way. It does not interfere — you just don't know it's there. Even the belt stays on.



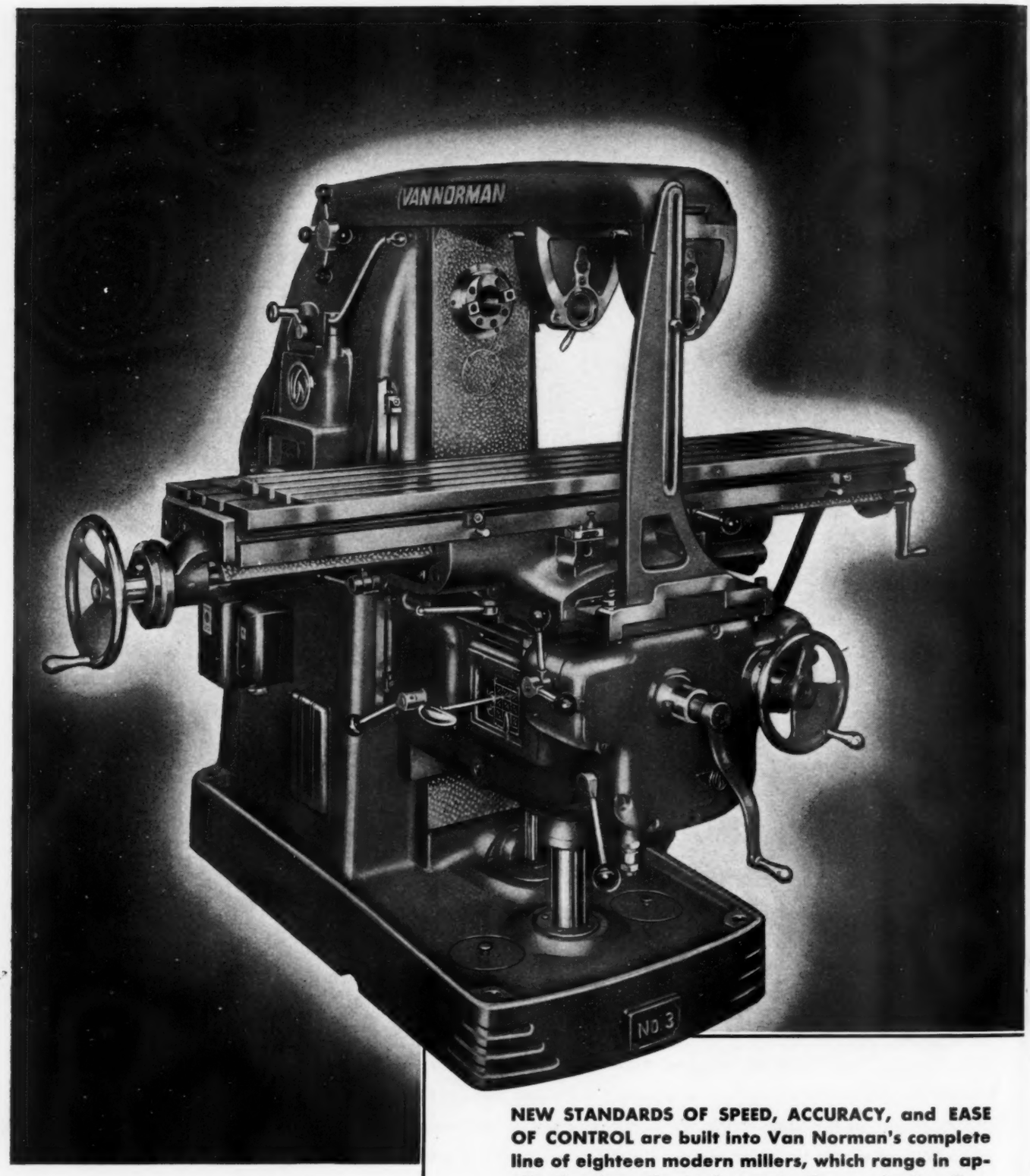
CINCINNATI

that saves time!

This Hinged Type Internal Grinding Attachment has proved a really practical method of grinding internally and externally at the same chucking. It not only saves up to 70% of set-up time but assures absolute concentricity. The attachment, driven by an independent motor, is standard equipment and permanently mounted in front of the wheelhead on all CINCINNATI Hydraulic Universal Grinding Machines. It contributes immeasurably to greater accuracy and faster operation.

In addition to the Internal Grinding Attachment there are many other features you're going to like about CINCINNATI Hydraulic Universals. They are sturdily constructed precision machines, so accurate a .0001" limit is practical. Built to handle your light or heavy toolroom grinding and variety production work quickly and easily, they assure practically continuous operation because maintenance has been virtually eliminated. CINCINNATI Hydraulic Universal Grinding Machines will step up your output through Faster Set-up, Faster Handling, Faster Grinding and Faster Sizing.

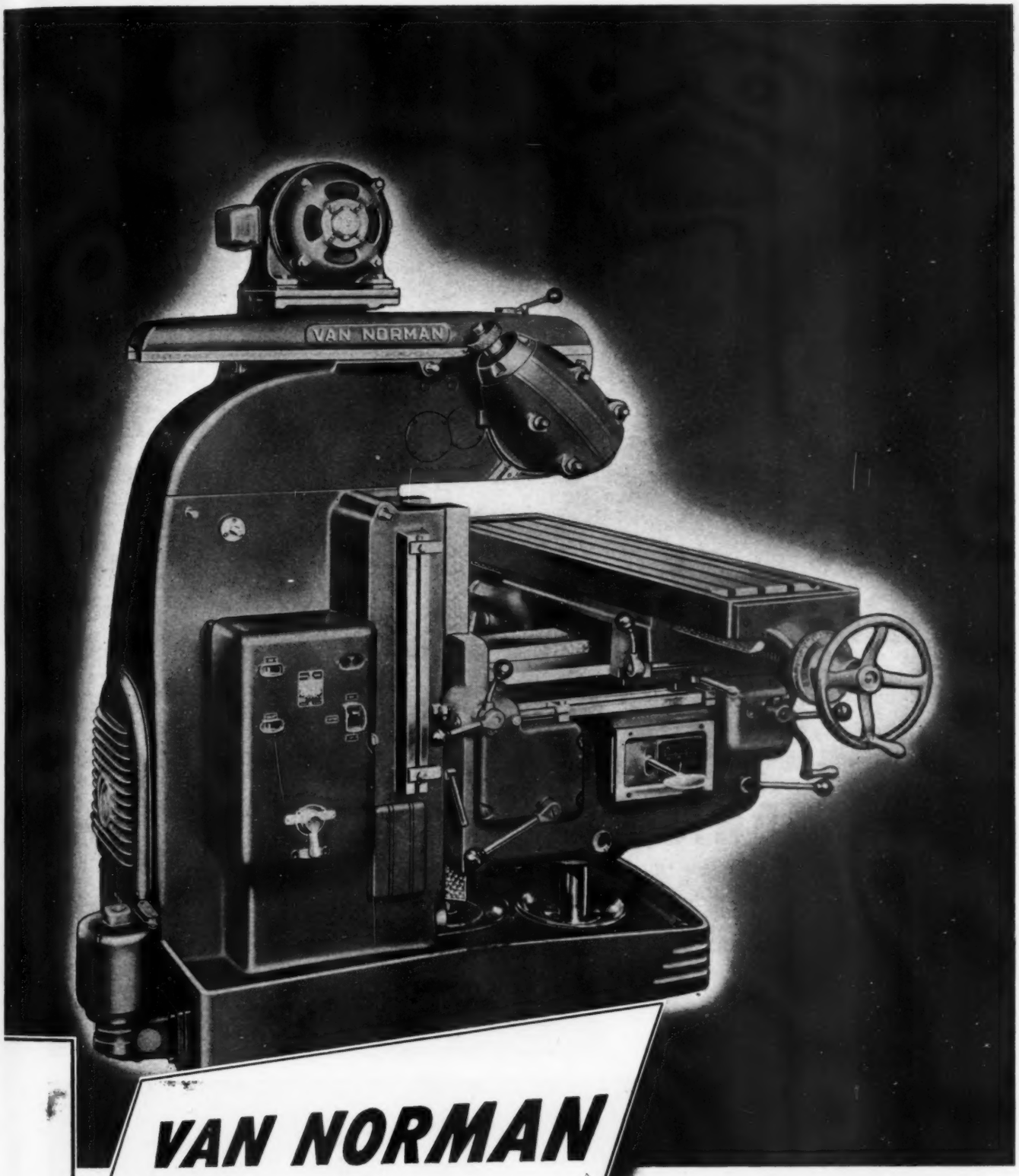
These versatile machines are available in 12", 14", 16" and 18" swings and between center distances up to 72". Specification catalogs G-486 and G-474 cover all features and their benefits. Send for your copies today.



No. 3-S HORIZONTAL KNEE-TYPE MILLER:
Plain and Universal
Table: 64" x 14"
18 Speeds: 25 to 1250 rpm
18 Feeds: ⅜" to 32"
6-way power feed front and rear directional controls

NEW STANDARDS OF SPEED, ACCURACY, and EASE OF CONTROL are built into Van Norman's complete line of eighteen modern millers, which range in application from the toolroom to the production line. And Van Norman's more than half-century tradition of quality underwrites your investment in all of these fine machine tools. There are no finer made in the world today.

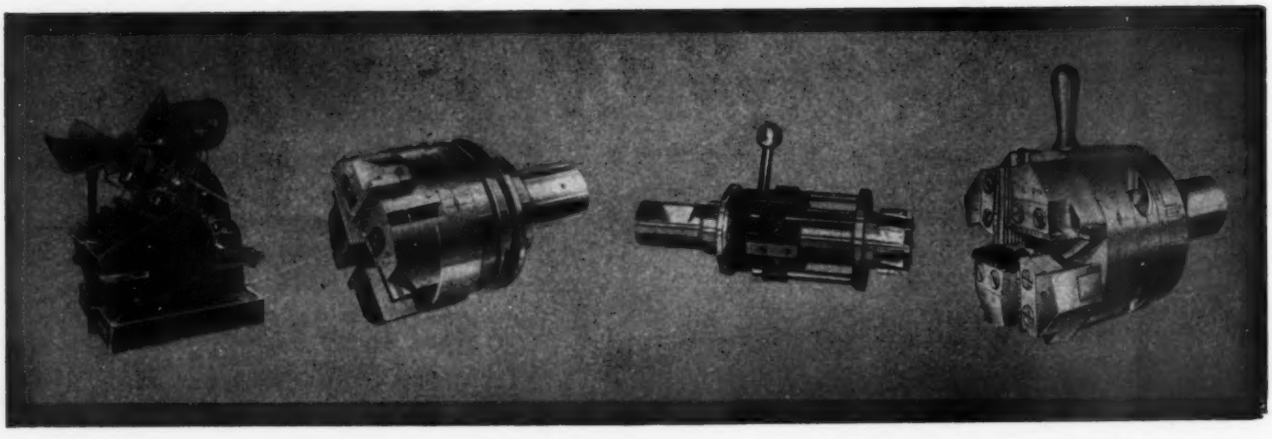
VAN NORMAN MACHINE TOOL CO.
Springfield, Mass.

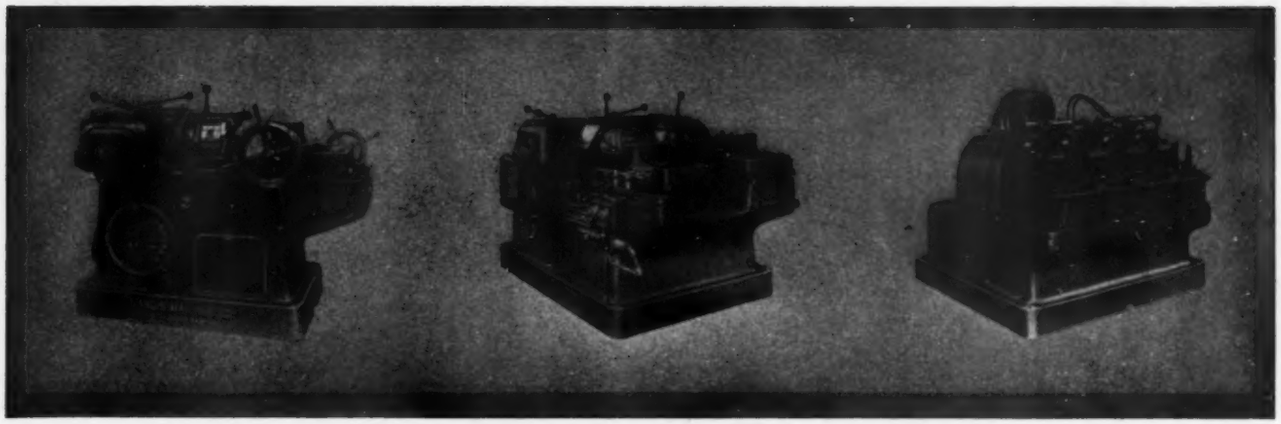


VAN NORMAN Milling Machines

No. 26 RAM-TYPE UNIVERSAL MILLER:
Table: 50" x 12"
Range: 28" longitudinal, 12" cross, 18" vertical
18 Speeds: 30 to 1500 rpm
18 Feeds: ⅛" to 32"

BE THREADWISE
LANDISIZE





Modern Tools for the National Emergency

—In Threading it's LANDIS—LANDMACO

1½R Shell Tappers and LANDMACO Threading Machines are used by almost every manufacturer for handling the threading of munitions components. These machines will handle difficult thread cutting operations on an unusually high production basis with assured Thread Accuracy.

The increased demand for More production requires machines which are capable of producing **more**—with minimum rejections, and at lowest possible cost—Investigate the LANDMACO as applicable to your Threading requirements—Write for Bulletin No. H-75.

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BOLT FACTORY THREADERS
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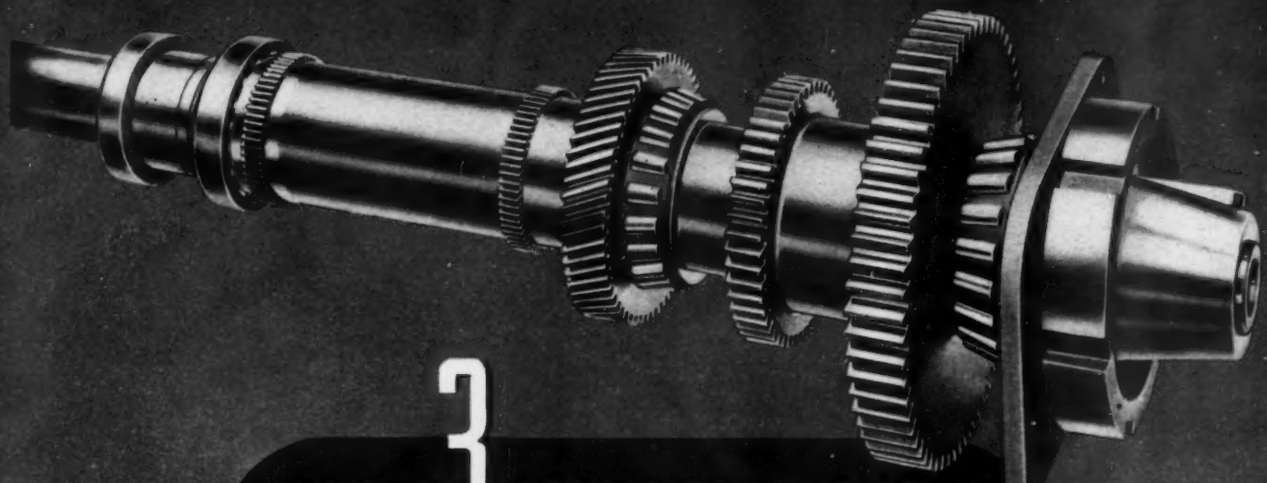
LANDIS COLLAPSIBLE AND ADJUSTABLE TAPS

—and the LANDIS Precision THREAD GRINDER

LANDIS

MACHINE COMPANY, Waynesboro Pennsylvania



THIS 3 BEARING SPINDLE *is now standard on* "AMERICAN" PACEMAKER

. . . for greater smoothness, quietness and rigidity at all speeds . . .

Unquestionably the three-bearing spindle is the stiffest spindle construction offered in lathe design. Complete elimination of deflection under heavy service is provided by an intermediate or center bearing at the very point where it is most needed.

This rigid spindle mounting assures long life for driving gears as well as smooth, quiet operation at all speeds and under heaviest service.

Spindle expansion resulting from temperature rise is taken care of in this three bearing "AMERICAN" construction by a rear bearing of the floating type.

The many new and outstanding characteristics of the "AMERICAN" Pacemaker Lathe are fully described and illustrated in Bulletin 15, available on request.

LATHES
RADIALS
SHAPERS

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U.S.A.

ARMSTRONG

This war will be won in the tool rooms.

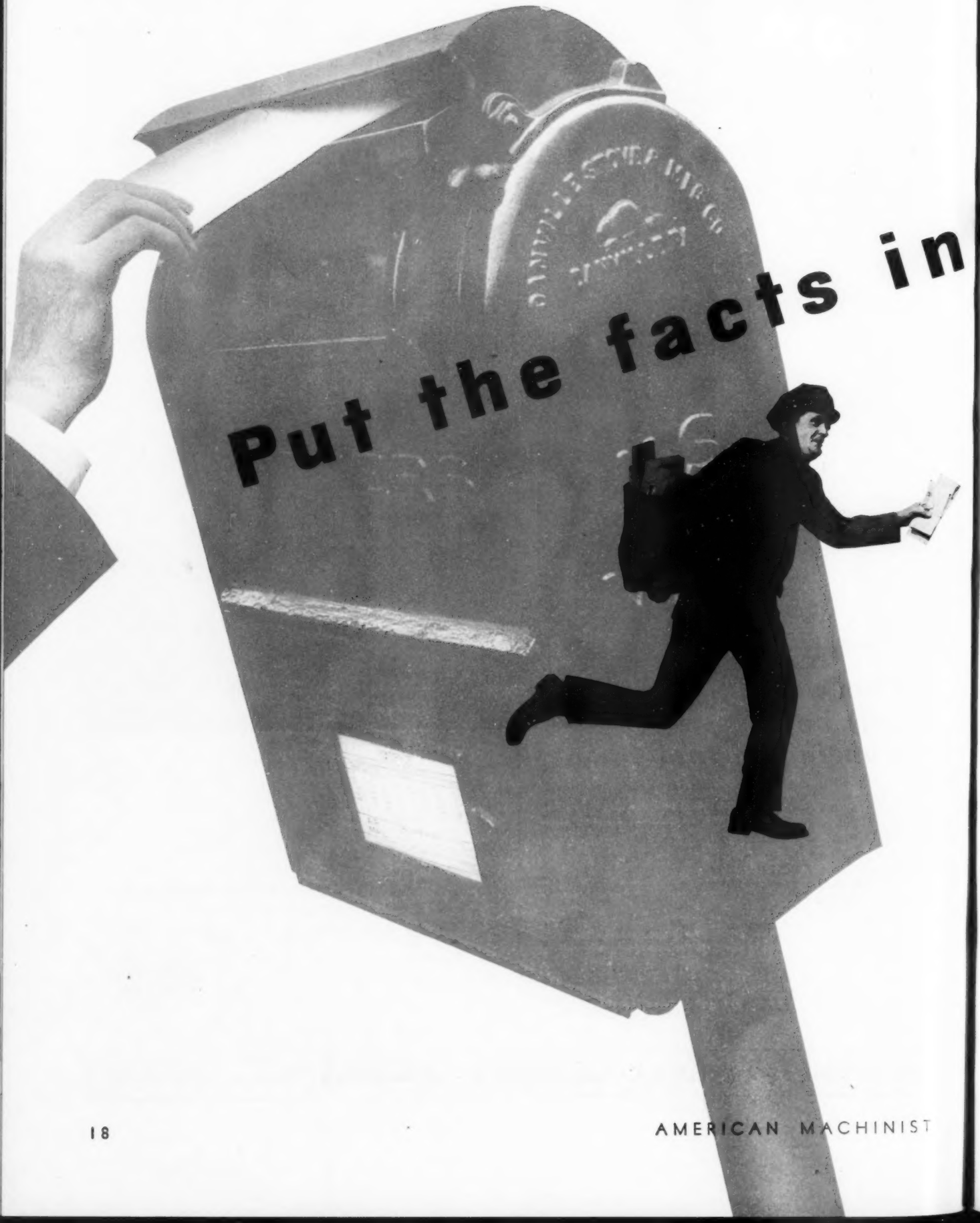
Any speed-up or increase in production starts in the tool rooms—with tools, dies, jigs and fixtures. Hence any delay in the tool room multiplies throughout the entire plant, and any speed-up in the tool room is an important step toward all-out American style production.

One easy and instant way to speed-up the tool room is to insist that ARMSTRONG TOOL HOLDERS be used for every operation on every lathe, planer, slotter and shaper. First, because ARMSTRONG TOOL HOLDERS end delays, reduce tooling-up to the selection of the correct cutter-bit, adjusting the clearance and tightening the set screw. Secondly, by permitting a general speed-up of machine tools—the greater strength and efficiency of ARMSTRONG TOOL HOLDERS permit far higher cutting speeds and heavier feeds than those carried-over from forged tool days.

Use ARMSTRONG TOOL HOLDERS for every operation and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. FRANCISCO AVE. CHICAGO, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms


Put the facts in a

a letter to Bryant

We may *think* we have only one problem. That problem of course is defense. To help solve it, Bryant productive capacity, already tripled, is constantly increasing.

But right now, today, we already have another problem, and that problem is to find new markets for American products, the moment peace returns.

If we are going to solve this problem we must find new ways to make more and better things that more and more people will be glad to buy for less and less money.

If we are going to solve this problem in time, we better start solving it now.

Probably you have already started. If your plans include jobs with internal grinding, it should pay to put the facts in a letter to Bryant. Just as Bryant engineers have found so many ways to combine operations, cut costs and speed defense production, so can they be expected to point the way to new profits on your future business.

And all the greater should be Bryant's opportunity to render substantial assistance if allowed to work with you at the earliest possible stages. By all means sit down today and put the facts in a letter to Bryant.

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws—End Mills—Taps—Dies—Screw Plates —Profile Cutters—

THE TOOLS YOU BUY AGAIN

Try them on the basis of ASSURED *better performance . . .*

Shop after shop has come to recognize the ruggedness, accuracy and fast cutting action of UNION TOOLS after proving them out on difficult jobs.

There is sound reason for the better performance of these cost cutting tools. One of these reasons is the *experience behind them*—an experience that involves years of research, as well as outstanding technical, metallurgical and manufacturing facilities second to none in the field of small tool production.

Because Union has the means for producing tools of the finest quality and concentrates every resource on achieving highest performance standards on all tools bearing the name "UNION", users of UNION tools can always be certain of efficient, economical service.

UNION TWIST DRILL CO.
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec
Representatives throughout the world

UNION

HERE'S WHY

TEXROPE* SUPER-7 V-BELTS ARE 4 WAYS BETTER!

1 **50% STRONGER CORDS!** Sensational new Flexon process makes cords 50% stronger than even those in former great Texrope belts.

2 **20% MORE CORDS!** Count them! You get 20% more of these tough, extra pulling power cords in every Texrope Super-7.

3 **INCREASED LIFE!** Cords float on amazing cool-running cushion rubber that absorbs shock . . . actually increases belt life phenomenally.

4 **EXTRA PROTECTION!** Exclusive duplex-sealed cover protects pulling cords against dirt, grit, moisture, and other adverse elements.

FOR FULL wartime production it is vital that power . . . *and power transmission* . . . be at their very peak of efficiency in your plant!

To get that efficiency, it's important that you know about Texrope Super-7 V-belts and what they can do for you. For here's a V-belt that is completely NEW . . . a V-belt that is literally *4 ways better!*

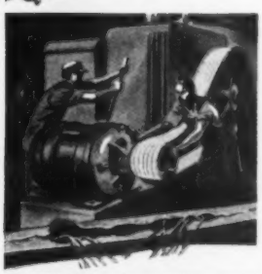
As a war-busy production man, you'll like Super-7's extra-strength construction . . . with 50% stronger cords, 20% more cords. You'll find the new rubber cushion section not only helps absorb the shocks of heavy wartime operation, but keeps the belt cool even under continuous, 24-hour-a-day requirements. You'll like the duplex-sealed cover for extra-protection . . . the true V-shape for maximum groove-grip action . . . the "matching" in sets for even pull, even wear.

For smooth, silent, slipless, longer-wearing, top-notch performance . . . use Texrope Super-7 V-belts!

The full story of these new belts can be obtained from your Texrope dealer or your nearby Allis-Chalmers district office. Or you can write Allis-Chalmers, Milwaukee, Wisconsin.

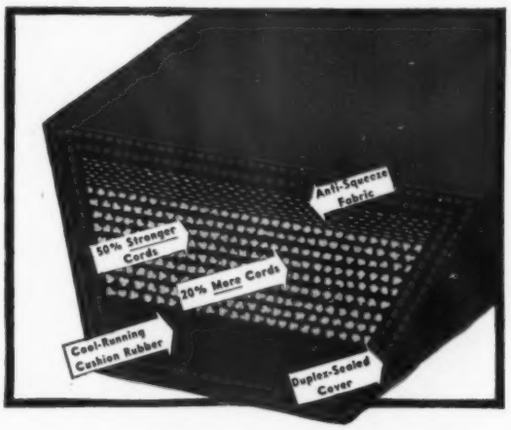
A 1486

LOOK OUT FOR DANGER in belts with stiff, unpliable cords! Such belts *look* strong... but actually they buckle over sheaves, build up excessive heat that attacks pulling cords. Result: Belt failure far sooner than you expect it.



WARNING SIGN! Sagging, slipping belts mean too much stretch not backed up by balanced cord strength. Motor must be pulled back often to take up slack. Result: When stretch limit is reached belt breaks under tension.

SUPER-7 TEXROPE BELTS are made by amazing Flexon process that *combines* flexibility with low stretch... great strength. Cords float on cool-running, shock absorbing cushion rubber. Result: *true* strength . . . *true* pulling power . . . *true* endurance.



Available in All Sizes ½ hp to 2000 hp

ALLIS-CHALMERS

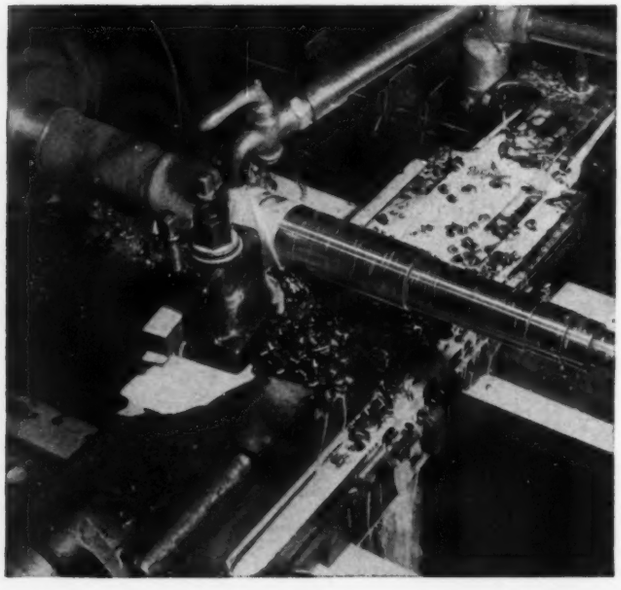
MILWAUKEE · WISCONSIN

*Trade mark registered U. S. Patent Office. Texrope Super-7 Belts are the result of the co-operative research and design genius of *two* great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers.

Save man-hours and machine-hours

From the forgings pictured above, the two spindles shown are rough and finish turned automatically on a 20″ Monarch Model M Lathe, equipped with Automatic Sizing.

The combination of quick setup, automatic turning of multiple diameters and automatic return of carriage to starting point enables one operator to handle two or more machines, without excessive effort and with quality production maintained. Low setup time permits small or large lot runs with automatic lathe production. Important also is the assurance of more perfect duplication than is practical with manual control.



How this job is done

1 Support work between centers.

2 Setup—set gauge blocks or template and set tool.

3 Turn multiple diameters.

4 Remove work from lathe.

Material—SAE-2350 steel forging. Tools—cemented carbide. Setup time—12 minutes. Cutting time—12 minutes per spindle.

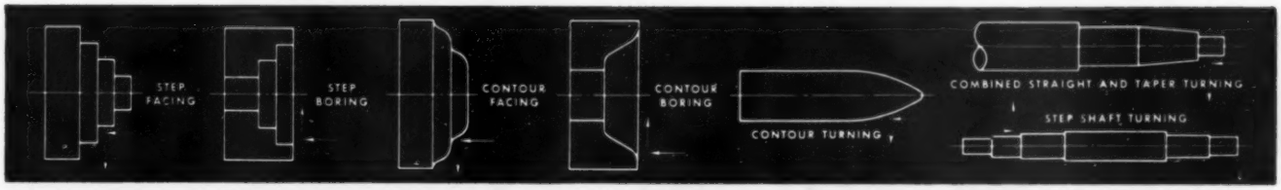
with Monarch AUTOMATIC SIZING

The diagrams on this page illustrate a few of the many varieties of work that can be done *automatically* and accurately with Monarch Automatic Sizing. It can be applied to Monarch standard or toolmakers' lathes. Lathes so equipped can be operated either automatically or manually, the change being simple, requiring a matter of seconds.

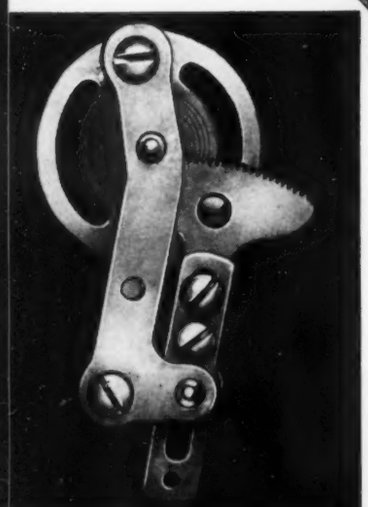
Today Monarch Lathes with Automatic Sizing are at work saving man-hours and machine-hours for VICTORY. THE MONARCH MACHINE TOOL COMPANY, SIDNEY, O.

MONARCH LATHES

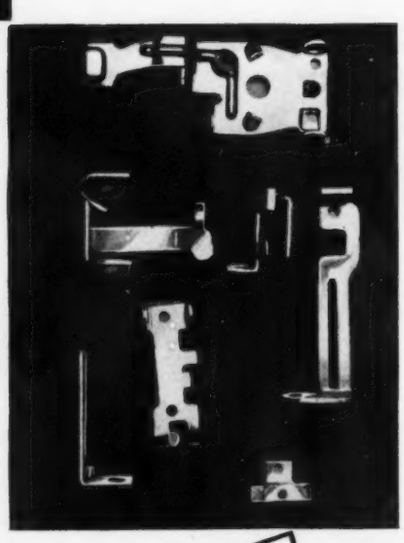
COVER THE TURNING FIELD



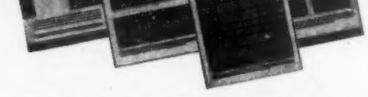
THE ROAD TO *Faster Production* WITH STAINLESS STEEL...



This Bourdon gauge mechanism withstands the highly corrosive conditions found in ***smelting plants*** and ***oil fields.*** Carpenter Stainless Strip parts include the hair spring, top and bottom plates.



These switch parts for ***electrical equipment*** keep wartime machinery going. They are mass-production items demanding close tolerances and extremely accurate distances between holes. Note how this Stainless Strip responds to severe bending, both with and against the grain.



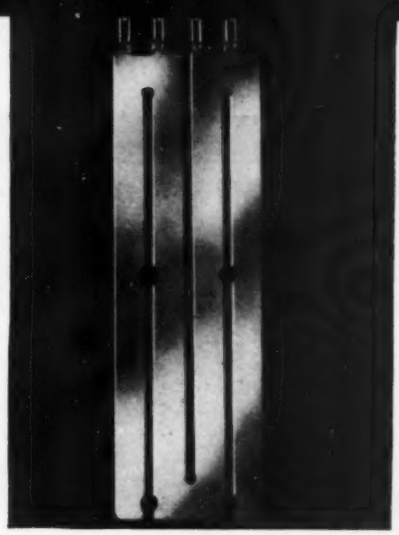
These Carpenter Data Sheets on welding, soldering, riveting, blanking, or punching, etc. contain much helpful information. They are free to Stainless Steel users in the United States. A note on your company letterhead will bring any of them to you.

for
Clean Blanking
Easy Forming
Faster Press Speeds
High Strength and Rigidity
Resistance to Heat and Corrosion
Easier Cleaning

Carpenter

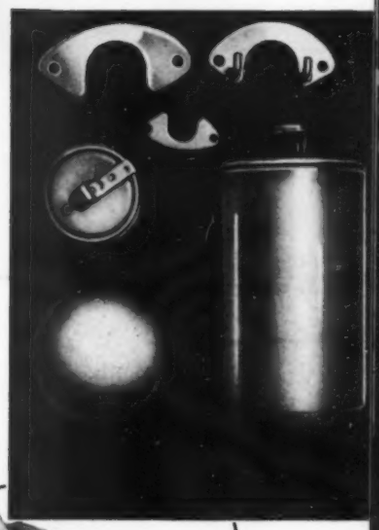
BRANCHES AT Chicago, Cleveland,

Heat control assembly made from Carpenter Stainless Strip. The metal must be drawn back considerably and still maintain its spring temper under excessive heat. Ease of blanking and bending and retention of hardness are important on jobs like this.



Resistors for booster motors that improve the pick-up of larger motors are mass-production products that have to be made "just right" every time. Here, soft, ductile Carpenter Stainless Strip helps get them out faster.

These ***steam trap parts*** utilize other advantages of this Stainless Strip. Easy welding for the bucket and float helps to speed production. And the deep draws possible with Carpenter Stainless Strip make it easy to produce the two halves of the float in one operation.



more than corrosion resistance

This Stainless Strip is giving wartime production the *Full Speed* signal in many plants producing direct and indirect defense products, like the ones shown on these pages.

Uniform, soft and ductile Carpenter Stainless Strip is saving wear on dies that take a long time to make. It is speeding the production of plane parts, radio equipment, precision instruments and many other wartime necessities.

From Carpenter's vast experience with the selection and fabrication of Stainless Strip has come a "know how" that is making the hard jobs easy and is getting the easy jobs done faster. Let your nearby Carpenter representative give you the fabricating help you want on the Stainless Strip that meets your production needs.

If you would like information on blanking, punching or shearing Stainless Strip, or if welding presents a problem—ask for Carpenter's Data Sheets on the operations that apply to your jobs. A note on your company letterhead will bring you any of these Carpenter production helps . . . or prompt assistance from our Metallurgical Department.

The Carpenter Stainless Selector Slide Chart can show you which Stainless best meets your requirements for heat or corrosion resistance. It gives quick answers to questions on fabricating problems. Free to Stainless Steel users in the U. S. A.

THE CARPENTER STEEL COMPANY
109 BERN ST., READING, PA.

Stamped and formed from Carpenter Stainless Strip, this vacuum disc for ***flow control regulators*** must successfully combat the corrosive effects of sulphur compounds. To meet close tolerance requirements, this disc is stamped to .001" flat. Then a small grinding cut is taken across the face.

STAINLESS STRIP

Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

Hundreds of other wartime products are made from faster-forming Carpenter Stainless Strip. We have shown some of them on these pages, but others are so vital to the nation's wartime effort that production data may not be disclosed.

FAIRCHILD BUILDS ✕ ✕ ✕ BOMBERS

AIDED BY SIMMONS LATHES

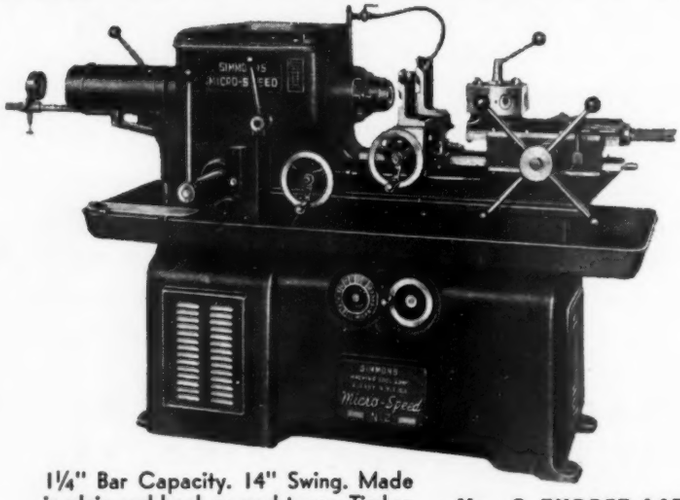
DELIVERY NEXT MONTH!

The Bolingbroke, like other great bombers making up the striking force of the United Nations, demands high precision manufacture of thousands of small parts.

At the Fairchild plant, Longueuil, Quebec, a battery of 20 dependable Simmons Micro-Speed Turret Lathes, equipped with Selector Dial Control, is on the job . . . helping to mass-produce Bombers for Victory!

Write Today For Descriptive Bulletin

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY, ALBANY, N. Y.



1¼" Bar Capacity. 14" Swing. Made in plain and back-geared types. Timken Tapered Roller Bearings. Spindle Brake. 1000 spindle speeds instantly available at a turn of the handwheel adjacent to Selector Dial on cabinet base.

No. 2 TURRET LATHE
(1¼" Bar Capacity)

SIMMONS
MICRO-SPEED
REG U.S. PAT. OFF.

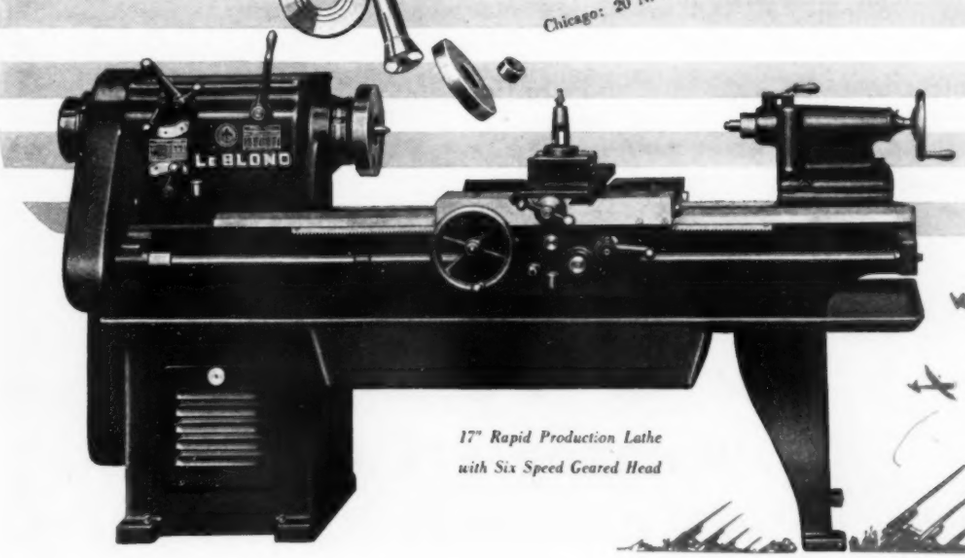
LATHES · TURRET LATHES · MILLERS · BORING MACHINES

LeBLOND rapid production lathes

From the whirling spindles of LeBlond Rapid Production Lathes all over the country daily flow a steady stream of finished turning . . . in an almost unlimited variety of shapes and sizes. The versatility, speed, and accuracy so vitally essential in the production of small parts for airplane and tank motors and machine guns, is amply provided in these remarkable Rapid Production Lathes. Built in three sizes: 20" and 17" heavy duty, and 13" (3 optional headstocks). For information, see our catalog in SWEETS, or write direct.

THE R. K. LeBLOND MACHINE TOOL CO.
Cincinnati, Ohio, U. S. A.
Largest Manufacturer of a Complete Line of Lathes
Chicago: 20 N. Wacker Drive, STA 5561 — New York: 103 Lafayette Street, Canal 6-5281

LeBLOND
CINCINNATI, OHIO
U.S.A.



17" Rapid Production Lathe with Six Speed Geared Head

Now is NO TIME to consider the WEATHER

Self preservation necessitates that the job at hand be considered immediately.

And now is no time for any industry to look far beyond the job at hand when the job is the preservation of the democracy which created and fostered that industry.

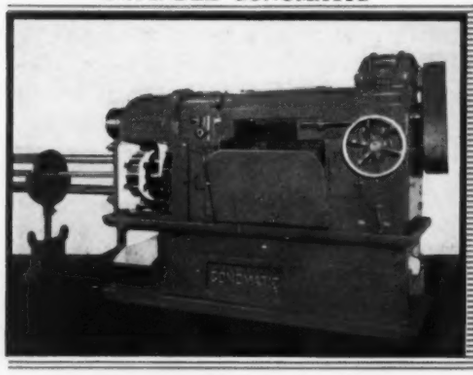
That is why we have priorities — that is why we believe in priorities.

Mass production, in which Cone has been a pioneer and leader, has been a prime factor in building up our American standard of living. That same mass production has now been called upon to protect it.

Cone is doing a 7-day week production job on defense work. Cone is on the job 100% to protect a standard which it helped create. Cone is building sturdy, accurate, volume-producing automatics as fast as possible without sacrifice to Cone standards. We all have a job to do NOW, and Cone is on the job to help do it.

We will be glad to send operator's handbooks and other information which will help speed defense production on all Conomatics now in the field.

8-SPINDLE CONOMATIC



CONE AUTOMATIC MACHINE COMPANY Inc.

WINDSOR, VERMONT, U.S.A.

SAVE TIME
WITH SOUTH BEND LATHES

SPEED

★

ACCURACY

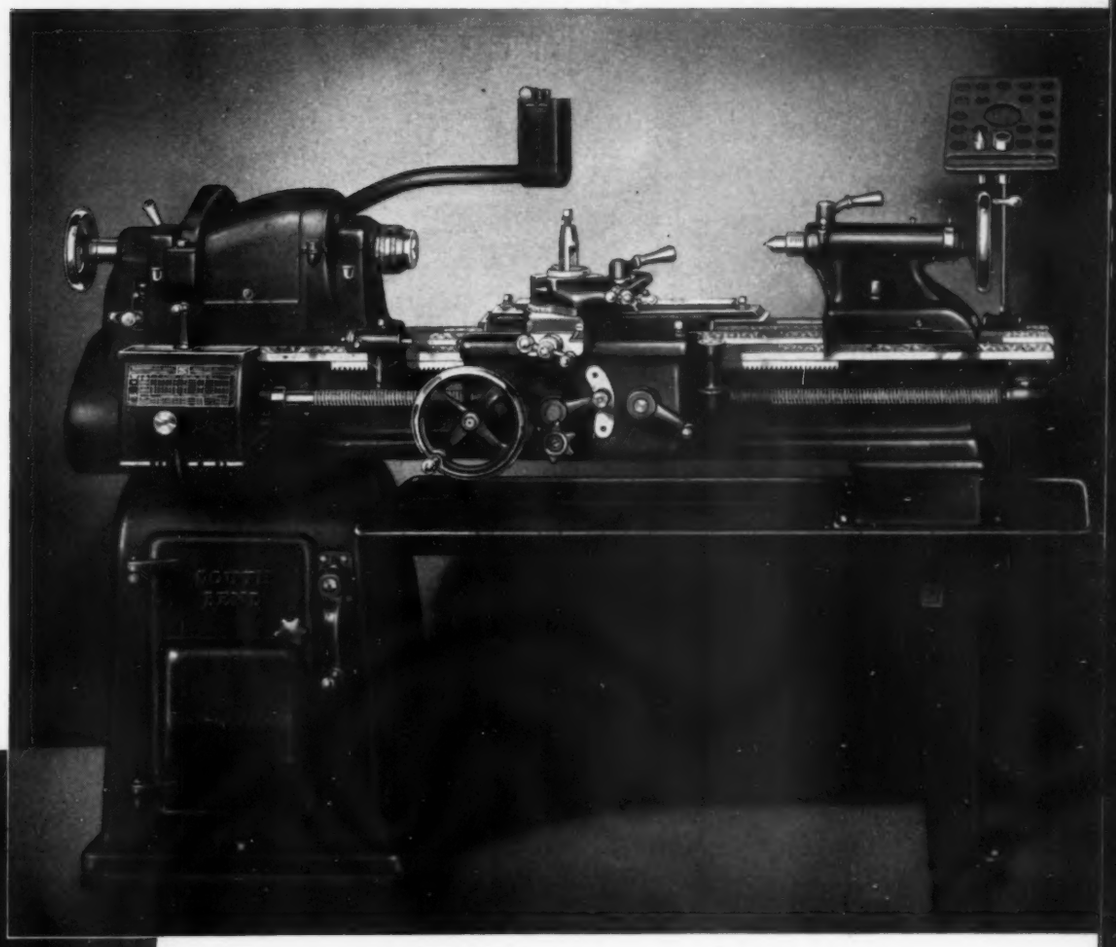
★

EASE OF OPERATION

★

VERSATILITY

★



13″ x 5′ South Bend Underneath Motor Driven Tool Room Lathe.

TIME is precious these days. The success of our national defense plan depends on maintaining heavy production schedules—there is no time to lose.

When you need increased production, when your tool room is rushed beyond its capacity, you can save time with South Bend Lathes. Their wide range of spindle speeds permits machining work with maximum cutting tool efficiency—their unquestionable accuracy assures uniform precision—their ease of operation reduces fatigue and prevents mistakes—their versatility facilitates quick changeover from one job to another.

South Bend Lathes are made in five sizes, 9″, 10″, 13″, 14½″, and 16″ swing. All sizes are supplied with tool room or manufacturing equipment. Our factory is prepared to ship priority rated orders in four to twelve weeks. Write for catalog and name of nearest dealer.

SOUTH BEND LATHE WORKS

276 EAST MADISON STREET, SOUTH BEND, INDIANA, U. S. A.

LATHE BUILDERS FOR THIRTY-FIVE YEARS

LET'S GO! U.S.A. KEEP 'EM FLYING!

Another specialized machine tool, developed by Kearney & Trecker engineers for the mass production of Milwaukee Milling Machines. This massive 25-ton machine is used for the machining of some of the larger units. It has five spindles—two horizontal and three vertical—each with quill adjustment and individually motor driven. The rail is adjustable vertically. This is one of the many specially designed machines which have helped to maintain the

Milwaukee MILLING

high standards of quality in the face of today's peak production requirements.

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U. S. A.

KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

Another in the series of advertisements describing specialized machines — originated, designed and built by Kearney & Trecker Corporation to provide accuracy and quality in the mass production of Milwaukee Milling Machines.

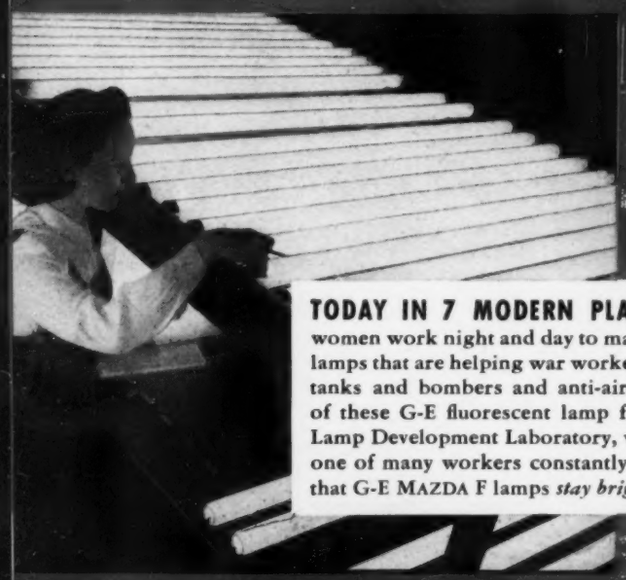
M A C H I N E S • • • •

MAZDA

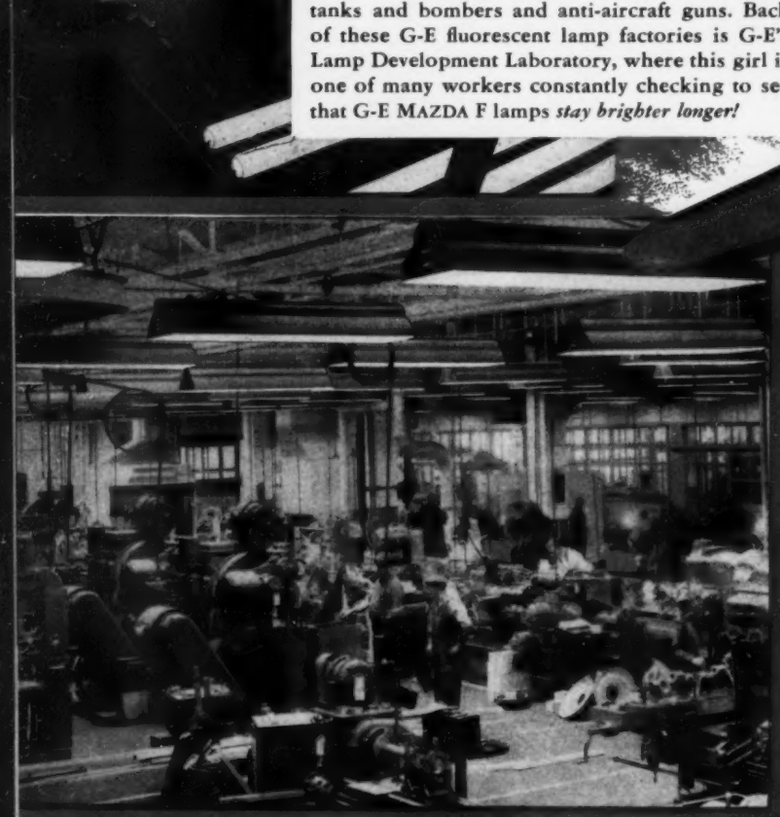
How to pull extra Man

THIS REVOLUTIONARY new kind of lighting is urgently needed in thousands of industrial plants engaged in vital war production. Some of these plants are probably customers of yours. If they can't buy a modern lighting system, show them how to get more out of their present lighting by washing and cleaning lamps and reflectors, re-painting walls and ceilings a light color, and by replacing burned out lamps promptly with G-E MAZDA lamps.

Read how G-E Fluorescent Lighting — Americ... new productive man-hours to wartime industry by spee... preventing accidents ... mak...



TODAY IN 7 MODERN PLANTS men and women work night and day to make the slim glass lamps that are helping war workers produce more tanks and bombers and anti-aircraft guns. Back of these G-E fluorescent lamp factories is G-E's Lamp Development Laboratory, where this girl is one of many workers constantly checking to see that G-E MAZDA F lamps *stay brighter longer!*



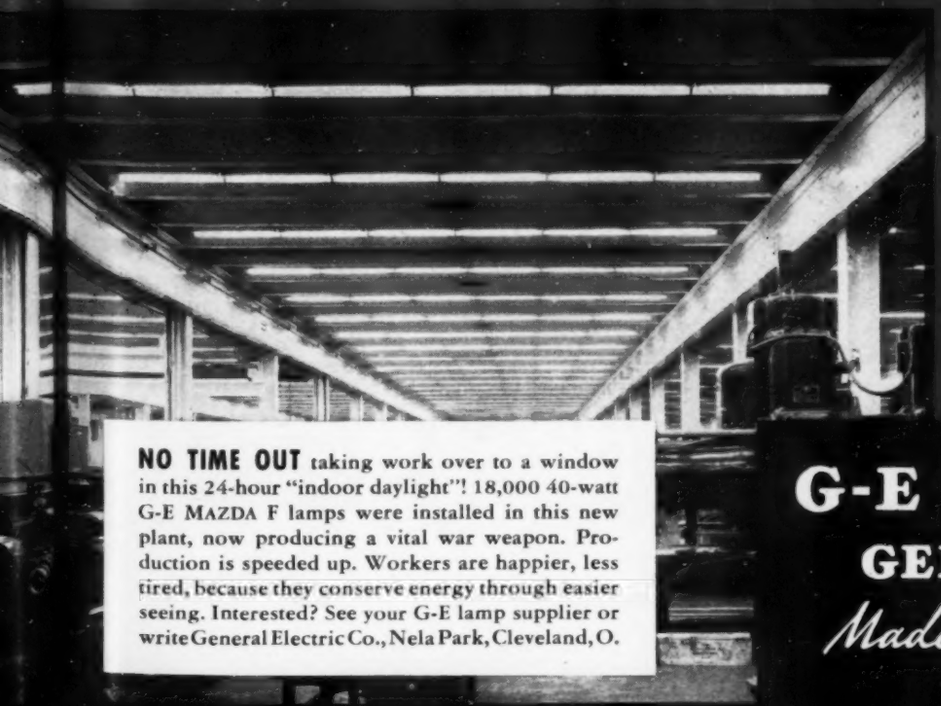
MILES OF G-E MAZDA F (fluorescent) lamps were installed in this typical new wartime plant. Officials say inspection of thousands of different parts would be a costly bottleneck in ordinary lighting. But the 5-foot 200-watt G-E MAZDA F lamps in this picture give workmen conditions approaching actual daylight! Show customers what G-E fluorescent lighting can do for them!

THE BATTLE OF 1943 is already being mapped out in industrial drafting rooms like this one, planning heat-treating equipment for armament parts, under cool indoor daylight furnished by G-E MAZDA F lamps. Draftsmen work with less strain, make fewer mistakes, get more done than with ordinary lighting.

n Hours out of a Glass Tube...

...ca's new 24-hour daylight — is adding millions of
... by speeding production . . . reducing spoilage . . .
. . . making seeing easier

...HEN AMERICAN PLANE PRODUCTION reaches its goal, much credit will be due to a ...w kind of light. Four-motored monsters like this Flying Fortress are being made faster ...der the cool indoor daylight of G-E MAZDA F lamps. But let industry speak for itself. ...5% reduction in scrapped pieces," says a machine shop. "50% fewer accidents," says ...other. "No time lost hunting good light for micrometer readings," says a machine tool ...anufacturer. Amazingly, results like this are obtained without adding extra floor space, ...achinery, or workmen!



NO TIME OUT taking work over to a window in this 24-hour "indoor daylight"! 18,000 40-watt G-E MAZDA F lamps were installed in this new plant, now producing a vital war weapon. Production is speeded up. Workers are happier, less tired, because they conserve energy through easier seeing. Interested? See your G-E lamp supplier or write General Electric Co., Nela Park, Cleveland, O.

30% FEWER HEADACHE TABLETS are needed in one plant since G-E fluorescent lighting was installed. By selling good lighting to your industrial customers, you are helping workers avoid eyestrain, save energy, and do their jobs more efficiently.

EXPERIENCED FIXTURE MANUFACTURERS now make over 100 fluorescent fixtures which are tested and certified by Electrical Testing Laboratories to exacting specifications for good service. Be sure your fixtures carry either the Fleur-O-Lier or RLM label.

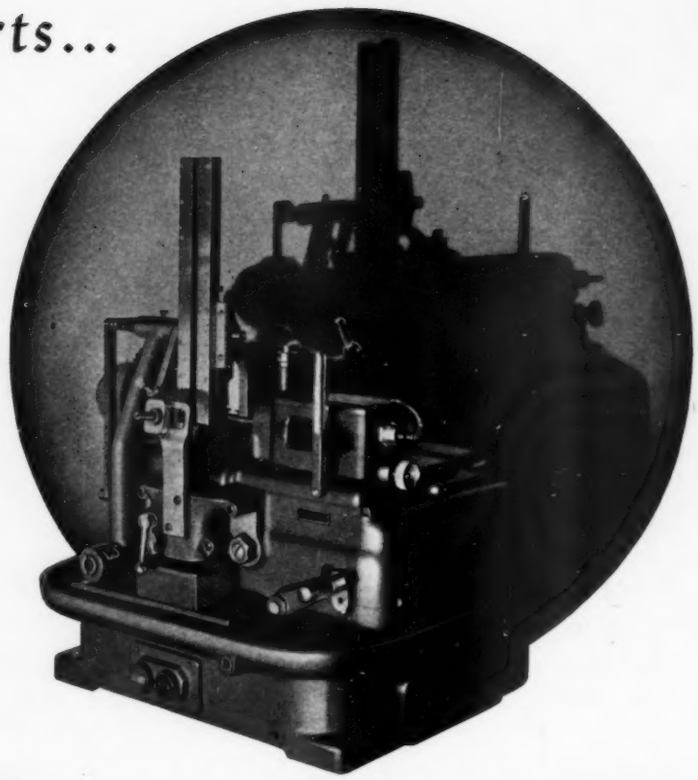
G-E MAZDA LAMPS

GENERAL ELECTRIC

Made to stay brighter longer

Perfect for Small Parts...

Difficulties in cutting teeth on small spur gears and pinions (and other similar parts that can be hobbed) are reduced to a minimum with the Barber-Colman Type "S" Automatic Hobbing Machine. Once the set-up is completed, all the operator need do is keep the magazine loaded with blanks and remove the completed pieces from the delivery basket or pan. All functions of the machine — placing the piece in the cutting position, hobbing the teeth (or form), and delivering the completed piece — are accomplished automatically and positively by adjustable control cams. The machine is very flexible, handling a wide variety of work up to ½" face by 1" diameter, and pitches finer than 24 in brass or 32 in steel up to 200 D.P. Because the work is small and the cuts light, high production as well as a high degree of accuracy can be obtained. Many small parts, formerly produced by slower or less accurate methods, are now being hobbed rapidly and economically on the B-C Type "S".



BARBER-COLMAN
TYPE "S"
AUTOMATIC
HOBBING MACHINE

For Instance...

One of the electric meter register pieces shown above is produced at the rate of 300 per hour. It is of soft brass, with 12 clock-form teeth, 90 pitch, 0.155" outside diameter and 0.10" face. The hob runs at 1520 r.p.m. and the feed is 0.0127" per revolution of the work. The hob is given 3 settings per grind, producing 36,000 gears per setting or 108,000 per grind. Production is more than double and the finish is much finer than formerly obtained.

BARBER B-C COLMAN PRODUCTS
HOBS. HOBBING MACHINES. HOB SHARPENING MACHINES. REAMERS. REAMER SHARPENING MACHINES. MILLING CUTTERS. SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 201 Loomis Street, Rockford, Illinois, U. S. A.

Today's "streamlined" gears must be GROUND

WHEN a gear can be comfortably overweight, muscle-bound, loose-meshing . . . then it can get along with less accurate finishing than a gear grinder provides. *But the streamlined, fighting-trim, hard-working gears in today's aircraft superchargers, tank transmissions, and the like* must *be right.* Total load-per-gear-tooth is *greater,* so load distribution *must* be even, constant, accurate. That calls for gear *grinding* . . . there's no shortcut, no substitute.

Pictured below is Yankee quality at work — a gear being ground. It's a P&W gear grinder; we can't reveal where it's being used or where the gear will go . . . but we can admit that the tolerance is a scant ±.0002"! Hardening distortions are being removed . . . this gear will be *right* . . . only grinding will do it.

Gear grinders — typical precision machines — are one of hundreds of classes of Pratt & Whitney tools now at work all over the country building America's strength for Victory.

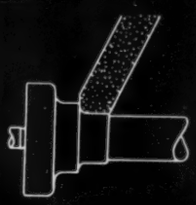
PRATT & WHITNEY

Division Niles-Bement-Pond Company

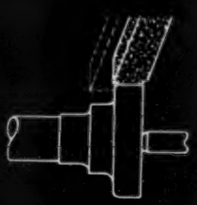
WEST HARTFORD • CONNECTICUT

To Finish The Job Quicker . . .

TYPE-C HYDRAULIC UNIVERSAL MACHINE A

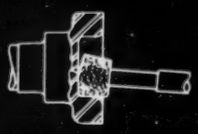


TYPE-C HYDRAULIC UNIVERSAL MACHINE A

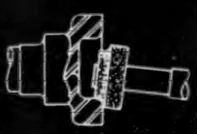


TYPE-C HYDRAULIC UNIVERSAL MACHINE B

TYPE-C HYDRAULIC UNIVERSAL MACHINE B



TYPE-C HYDRAULIC UNIVERSAL MACHINE B



TYPE-C HYDRAULIC UNIVERSAL MACHINE B

MAKE YOUR GRINDERS DO "DOUBLE DUTY" LIKE THESE

Suppose you wanted to grind shafts such as the one shown above. Suppose that in grinding this shaft "speed in production," and "close concentricity between the ground surfaces" were two important requirements.

One manufacturer was faced with this problem. He installed two Landis Type C Hydraulic Universals. Using only these two machines all of the above illustrated operations are performed. On machine A, a diameter, a radius and an adjoining face are external ground with one wheel, while another diameter, a radius and an adjoining shoulder are external ground on the same machine with a different wheel. Machine B is used to external grind the inside radius, the O.D. and the face of a flange with the same wheel. In addition the same machine is used to grind the inside diameter, the inside radius and face, and the radius at the entrance of the counterbore in the flange. Two grinding wheels are used.

Thus both important requirements are fulfilled. Because the Universal wheel base can be swiveled with ease and because it requires but little time to change over from an external to an internal set-up and vice versa, rapid production is obtained. Since only two machines are used, the surfaces are held closely concentric.

If you are confronted with a problem involving rapid production, call in a Landis representative. Surely, from among the many types and sizes of grinding machines offered by Landis, the correct machine for your job can be found.

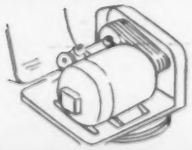
Unusual Performance As Usual

PRECISION LANDIS GRINDERS

394

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA

MICROSPHERE WHEEL SPINDLE BEARINGS



COMPACT MULTI-SPEED HEADSTOCK

MULTI-SPEED HYDRAULIC TABLE TRAVERSE

BE MODERN...equip your machines with

SJOGREN SPEED COLLET CHUCKS

Are you getting full value from your investment in tool-room and engine lathes?

A Sjogren Speed Collet Chuck gives greater capacity, saves time, increases accuracy and assures better results.

It is readily adapted for use on the spindle nose of your lathes, takes precision collets — enabling the operator to do better work . . . . faster!

Available in three sizes: 1", 1-3/8" and 1-3/4" capacity.

Furnished with Hardinge Precision Collets

HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

"PUT IT ON THE BLANCHARD"

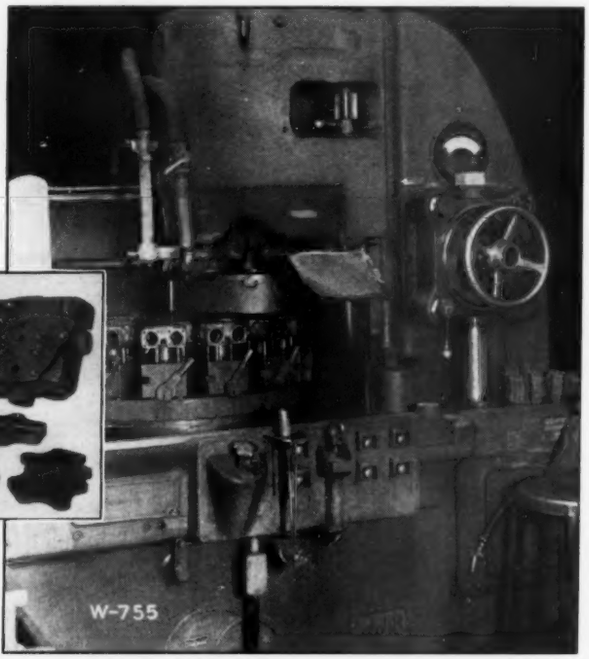
BLANCHARD

+.0003"-.0001"
WITH VERY FINE FINISH

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*



No. 18 Blanchard grinding oil pump bodies.

Group of oil pump body parts — all ground on No. 18 Blanchard.

PRODUCTION INCREASED 71 PER CENT

BOTH roughing and finishing are done by the same No. 18 Grinder on these oil burner pump parts. First ground from the rough, then normalized and ground again, the parts are then ready for boring and drilling, locating from the flat Blanchard Ground surfaces. After all machining is done the parts are finish ground on the Blanchard to limits of +.0003"–.0001" and to a very fine finish. The pump body must have its end square with a finished bore. Twelve are held at one time on fixtures mounted on one base plate, and magnetically held. It only takes a few minutes to remove the group of fixtures, leaving the chuck clear for other work.

Blanchard cylinder grinding wheels, manufactured by the Blanchard Machine Company, are used on this job. This was another reason for being able to increase the production from 28 to 48 pieces per hour.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

IT PAYS 5 WAYS

TO *Standardize* ON EX-CELL-O THREAD GRINDERS

1 DESIGN . . . Ex-Cell-O engineers, who introduced precision thread grinding to U.S. industry, are familiar with today's threaded work needs. Ex-Cell-O thread grinders are designed to meet these needs specifically.

2 CONSTRUCTION . . . Ex-Cell-O thread grinders are substantially, compactly built—to give years of service—with base, work table, controls, compartments, etc., all integral parts of a uniform exterior design. Moving parts are made for *precision* operation. Work table slides, for instance, are heavily ribbed and normalized to eliminate warpage. Hardened, ground and lapped steel rollers support work table on scraped ways. Anti-friction rollers are retained in steel carriers so that table moves with uniform freedom, preventing variation of table drag that would affect accuracy of work.

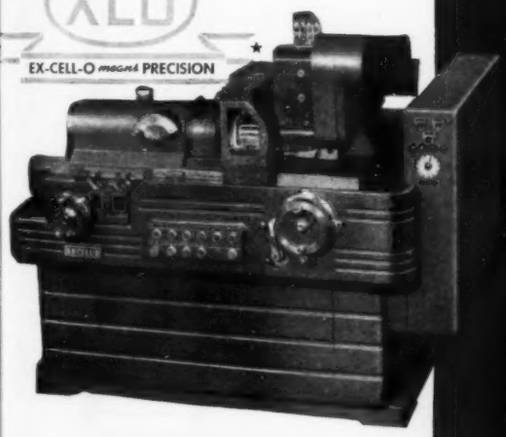
3 ADAPTABILITY . . . Within the designed capacity of each of nine Ex-Cell-O standard thread grinding machines—automatics, universals, and plain production—a wide range of work is possible. Users of Ex-Cell-O precision thread grinders are finding that on many work pieces more overall speed and economy are attained by precision grinding *all* threads called for, including even those not requiring the extreme accuracy of grinding.

4 WIDE VARIETY OF STYLES . . . Ex-Cell-O has developed precision thread grinding to cover the many requirements of American industry for precision threaded work. There are available nine different styles of Ex-Cell-O thread grinders—*all standard machines*—with greatest practical interchangeability in use of dressers and lead screw and nut assemblies.

5 MADE BY DEPENDABLE FIRM . . . Only one standard is acceptable at Ex-Cell-O—the greatest commercial accuracy it is possible to attain, whether it be in the designing of precision thread grinders or any of the various other precision machines and tools bearing the Ex-Cell-O name.

XLO

EX-CELL-O *means* PRECISION



Above: *Ex-Cell-O Style 39-A . . . for precision grinding internally threaded work. One of nine styles of Ex-Cell-O standard thread grinders.*

BUY UNITED STATES DEFENSE BONDS AND STAMPS

Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS

EX-CELL-O CORPORATION • DETROIT

TO SPEED UP MILLING, DRILLING, TAPPING AND ASSEMBLING OPERATIONS WRITE US NOW

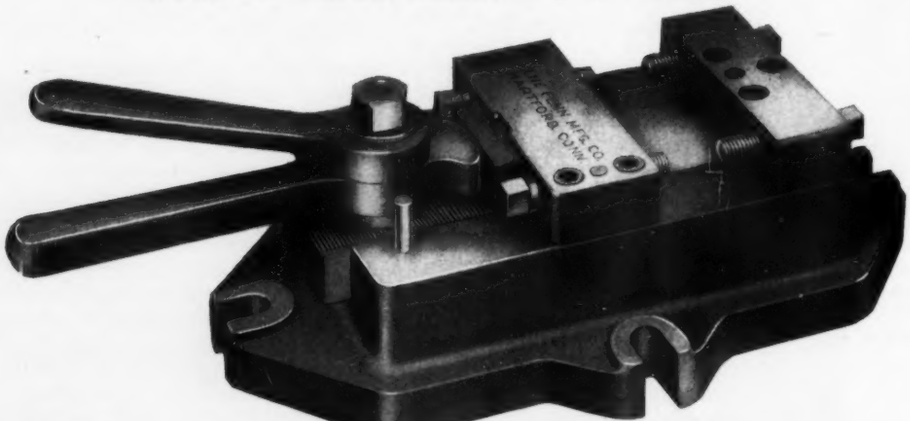
25 Years of Performance in America's Big Plants

FOR over twenty-five years the Fenn Quick-Action Vise has been used in a wide range of work in industrial plants throughout the country. It is highly regarded by users because of its speed, accuracy and dependable service.

We have never yet had a Fenn Vise returned to us because of its failure to perform as represented. Every Vise is built with the greatest precision for accurate work. Sliding and stationary jaws are precision fitted. All working parts hardened ground steel, with heavy duty base of fine grained, well seasoned iron. Why not put the Fenn to a real test in your plant?

FENN

Made in three sizes: 4", 5" and 7"

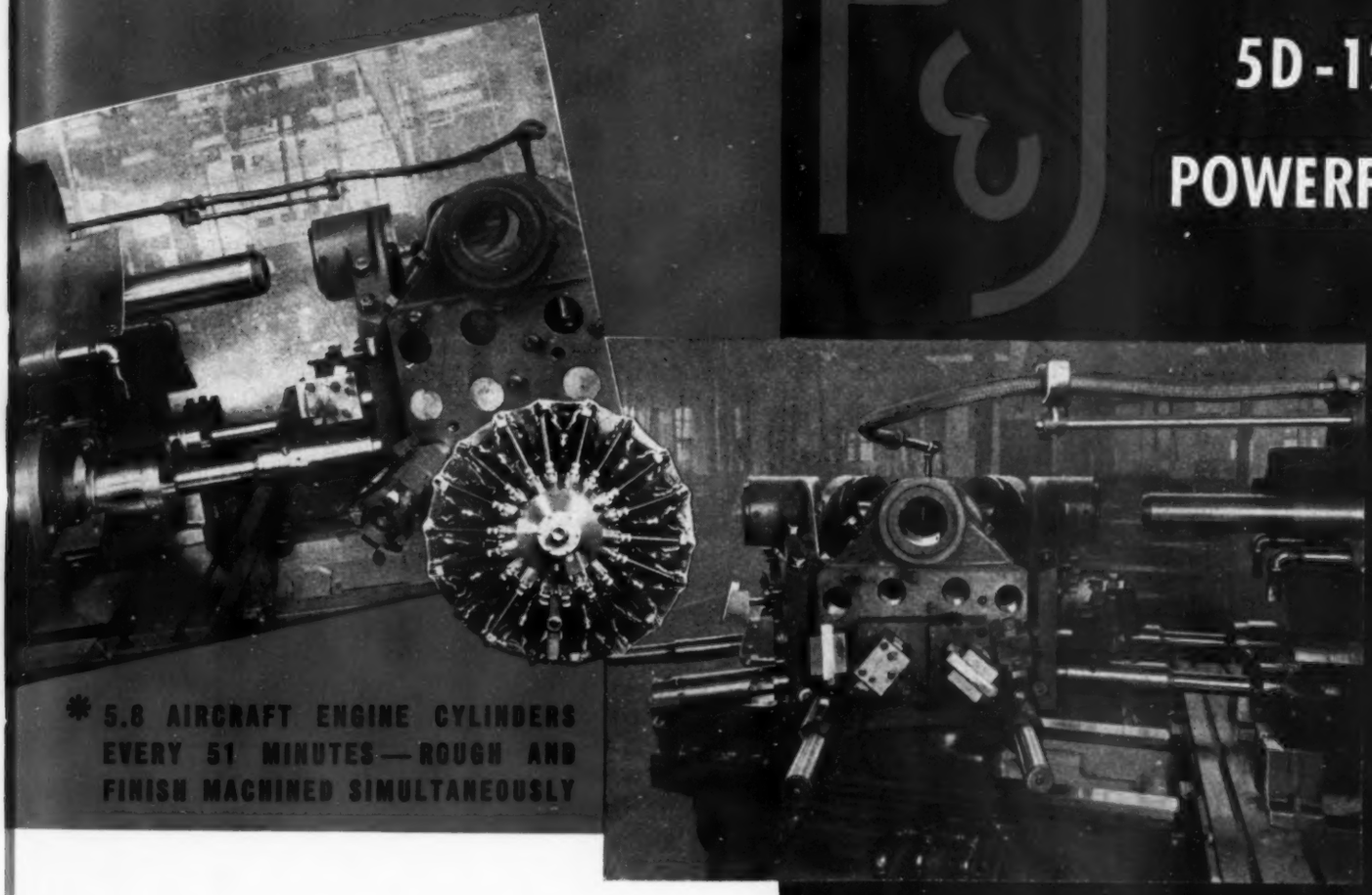


Bolt Holes can be located as per customer's specifications if standards do not apply. Swivel Jaw Type Vises made on order

THE FENN MANUFACTURING COMPANY
HARTFORD, CONNECTICUT • ESTABLISHED 1900

*Results

FROM PLANNED PRODUCTION ON A 5D-12 POWERFLEX



* 5.8 AIRCRAFT ENGINE CYLINDERS EVERY 51 MINUTES — ROUGH AND FINISH MACHINED SIMULTANEOUSLY

Through the use of special tooling and a rigid type of overhead pilot, this two spindle P&J machine set up in the plant of Lycoming Division, Aviation Manufacturing Corp., Williamsport, Pa., is an outstanding contribution to aircraft cylinder production.

Tooling for first or internal operation is mounted on turret in alignment with rear spindle while second or external operation is tooled up in alignment with front spindle. The two holdings (one on each subject) are performed simultaneously, with a three jaw chuck and an air operated fixture on rear and front spindles, respectively. One cycle of machine brings the rough machined steel forgings up to the finning operation handled on another type machine.

In addition to high productive capacity, the P&J Automatic assures flexibility, ease of change over, minimum floor space, low power consumption, rigidity and high finish accuracy. Many modern features of the 5D12 Powerflex provide a machine which is ideal for aircraft engine work demanding economical production, extremely fine finish, accuracy and heavy cutting under continuous operation.

One operator can readily handle two or even three machines on this class of work.

OPERATIONS PERFORMED

REAR SPINDLE: (Presenting thread end to spindle)

1st T.F. — Loading Bar.

2nd T.F. — Rough bore half way; rough turn 4.75" -4.841 dia.; rough face end; rough turn and straddle facer flange; rough form groove.

3rd T.F. — Semi-finish above cuts; chamfer.

4th T.F. — Size turn 4.841" dia.

5th T.F. — Unloading.

FRONT SPINDLE: (Presenting finished end to spindle. Locate in ring on 4.841" dia. and hold back against hardened and ground steel plate with 3 air operated fingers or clamps over flange).

1st T.F. — Loading.

2nd T.F. — Rough bore hole half way; rough turn and face finished dia.; rough turn thread dia.; rough face end.

3rd T.F. — Semi-finish above cuts; chamfer corners; turn 4.910" dia.; bore hole through.

4th T.F. — Recm hole 4.608" dia. through.

5th T.F. — Unloading bar.

POTTER & JOHNSTON MACHINE CO.

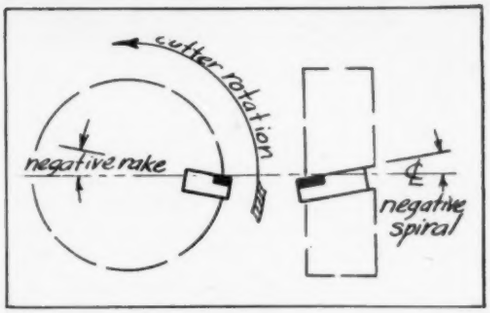
PAWTUCKET, RHODE ISLAND

FIRTHITE **Negative Rake** Face Mills speed the milling of parts for all calibers and types of both naval and artillery cannon.

Hyper-speed FIRTHITE Mills multiply armament production of all high-strength alloy-steel equipment vital to our War Effort.

These cutters are operated up to TEN times the speed and SIX times the feed of high-speed steel mills.

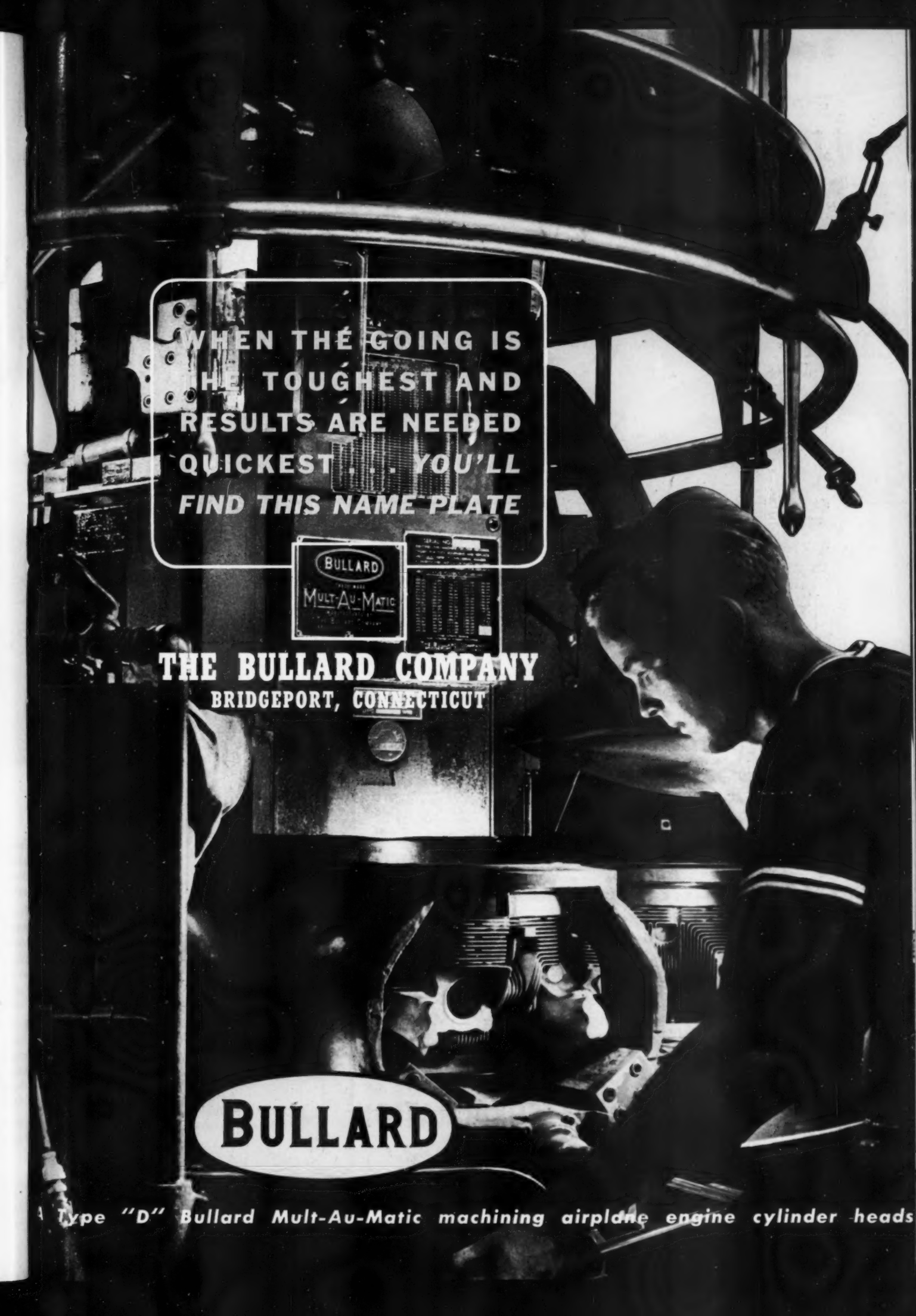
Complete face mills of this type are made by the OK TOOL COMPANY, INC.



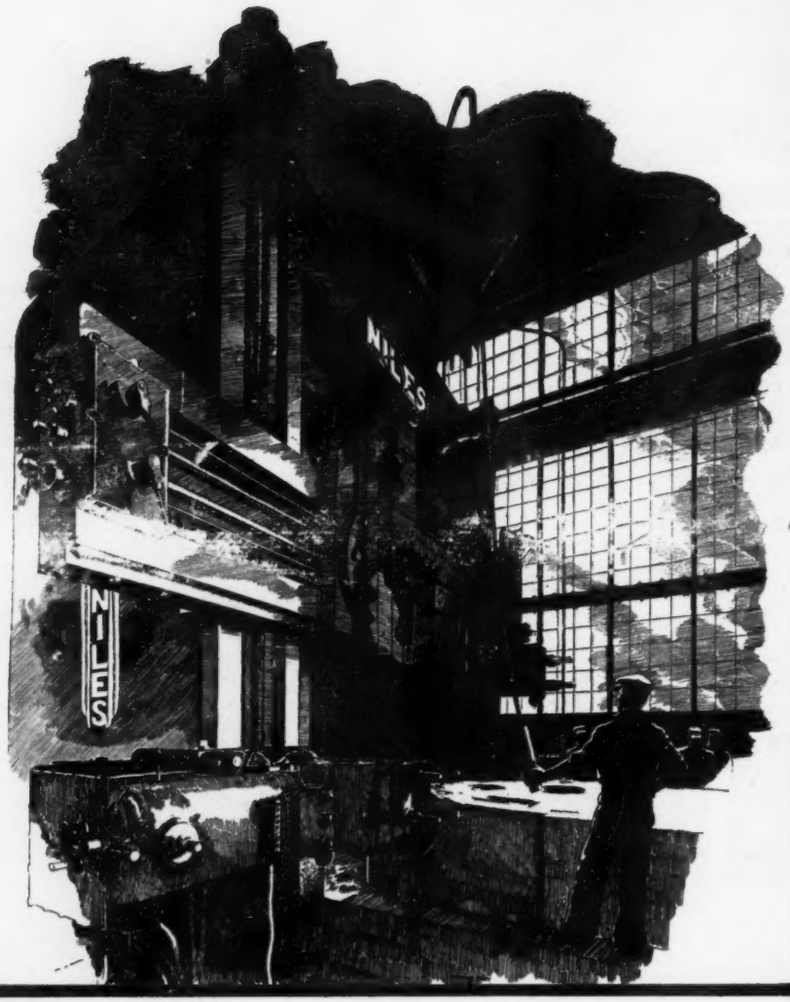
Design of FIRTHITE-tipped face mill for steel. Note: Both **rake** and **spiral** angles are NEGATIVE!

FIRTH-STERLING STEEL COMPANY

OFFICES:
McKEESPORT, PA.
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT



Type "D" Bullard Mult-Au-Matic machining airplane engine cylinder heads

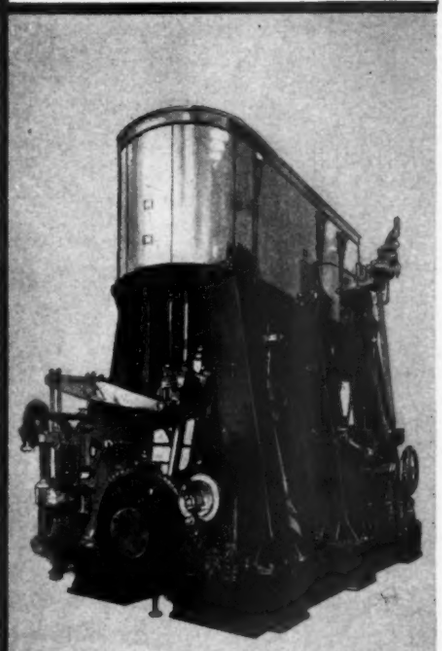


The FIRST shall be LAST

NEARING completion, far ahead of the production schedule, is an order for massive planers to be used in finishing the heaviest armor plate for America's warships. The parts for these huge machines are seldom made in quantities except in time of war and the equipment for mass production of such items is very scarce. We have such equipment in our shops but, at the time this order was placed, all of it was working 24 hours a day on orders for steam engines to be used in the Liberty Ships and large machines for defense production. So we borrowed equipment time from the Liberty Ships order to machine the heaviest parts of the first planer. Then we set it up in our own shops and used it to machine these same parts for the balance of the order. This move speeded up the planer order by months.

The first planer finished will be the last one shipped, but the last shipment on the order will be weeks ahead of our own schedule, many months ahead of any schedule which could have been set up otherwise.

This resourcefulness which assumes such importance in times of war is also important in times of peace. It has enabled General Machinery to serve the Nation well through five wars. It has kept the wheels turning in times of peace. It will again be at the service of American Industry when the war is over and the ways and workings of peace are resumed.



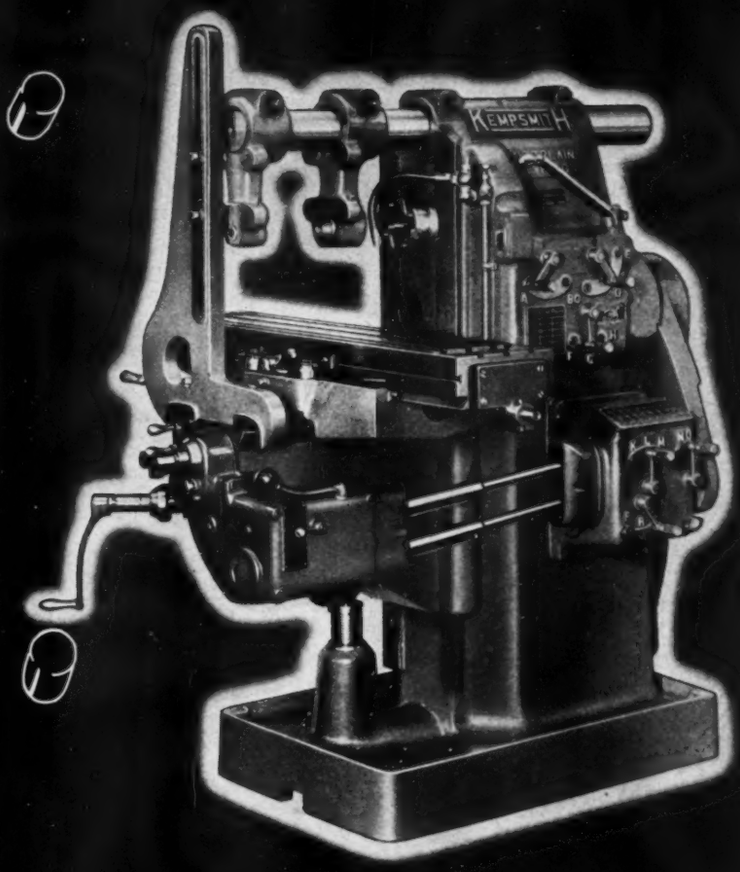
● 2500 h. p. triple expansion steam engine used in LIBERTY Cargo Ships

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

GENERAL MACHINERY ORDNANCE CORPORATION

THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO.



Precision **PLUS**
Economy **FROM THE LATEST PAGES OF THE 54-YEAR HISTORY OF**
KEMPSMITH
MILLING MACHINES

KEMPSMITH TYPE "G" MILLER

For Tool Room and general production use,

the Type "G" KEMPSMITH All-Geared Unit (Plain or Universal) has proved by performance under strenuous Defense demands, that it is a worthy member of the KEMPSMITH family of reputable milling machines . . . with Centralized control, 18 speeds and feeds (ball-bearing speed, feed and spindle assemblies), Knee Gib, Unit Construction, Motor-in-Base . . . also available with power rapid traverse at additional cost . . . economical in first cost, precise, and efficient —

. . . a "brother" of the famous KEMPSMITH MAXIMILLER!

PRECISION
MILLING MACHINERY
Experience SINCE 1888
KEMPSMITH MACHINE CO.
MILWAUKEE • WISCONSIN

NO PRIORITIES OR SHORTAGES

AFFECT THIS OFFER

Can we give you a hand with your steel problems? If you're working on war production, our experience and full cooperation in helping you use steel more effectively is available *right now* — and with no strings attached.

The steel engineers and metallurgists we have assigned to this important job of getting the most out of steel can bring to the solution of your problems the very latest ideas and time-saving techniques in the working and treatment of steel.

In helping you smooth out the difficulties inseparable with the switch-over to war-time production, these men can call upon the facilities of the most completely equipped steel research laboratories and the largest steel-making plants in America. They can clearly interpret your needs to our steel makers to assure the most prompt and efficient action. Their assistance is eminently practical.

The task that war has set America means that you've got to learn in a hurry —and you've got to achieve production with the means at hand. These men will help you do both.

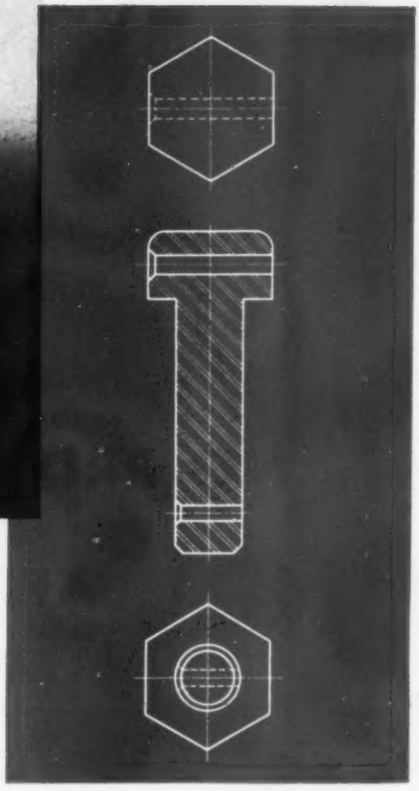
Their services are available to every user of Carnegie-Illinois Steels and to every manufacturer of war equipment.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

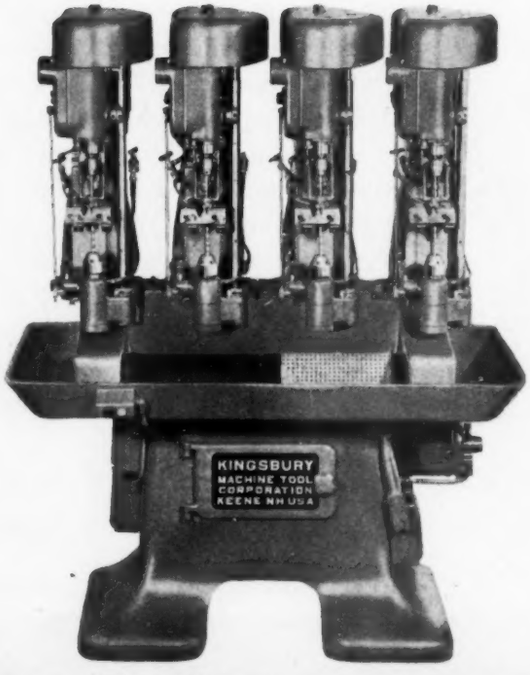
UNITED STATES STEEL



A Standard Machine *by KINGSBURY* for High Production on "Cross-hole" Jobs

KINGSBURY, specialists in automatic equipment for speeding up all types of production operations, have applied their skill to the production of a standard drilling machine with the efficiency of the well-known FLEXIMATICS. On jobs where drilling time is short and the operator needs both hands to handle the work, KINGSBURY Drilling and Burring Machines provide completely automatic operation, from the time the work is placed in the fixture until it is automatically ejected. The machines illustrated consist of standard No. 8 Drilling Units, standard cross-hole drilling fixtures and standard underneath burring units. The latter operate while the top drills are retracting. They are available in one to four spindle units, with or without the burring units and fixtures.

Bank on KINGSBURY'S reputation for efficient automatic equipment! Choose these Drilling Machines for those cross-hole jobs that slow up production in your plant.



KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

FOSDICK

High Speed Sensitive Drills

Speed Tools for WAR PRODUCTION

● The Tool and Die shops of the Nation are working 24 hours a day to speed urgently needed tools to War Industries.

Within a 20 mile radius in one of America's humming industrial cities hundreds of Fosdick High Speed Radials are performing drilling, reaming, facing and tapping operations on a host of jobs—speeding tools to War Industries.

The one illustrated is typical of the Fosdick Sensitive Drills operating in these Tool and Die Shops—singly and in batteries. For speedy production — accuracy — and low cost operation, specify Fosdick Sensitive Drills.

Built with single and two speed motors, with a range of 6 to 18 speeds in capacities up to 1¼" dia. holes.

For specific data on Fosdick Sensitive Drills ask for bulletin Fosdick High Speed Drills H.S.A.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI ··· OHIO

MORRIS MOR-SPEED *Radial*

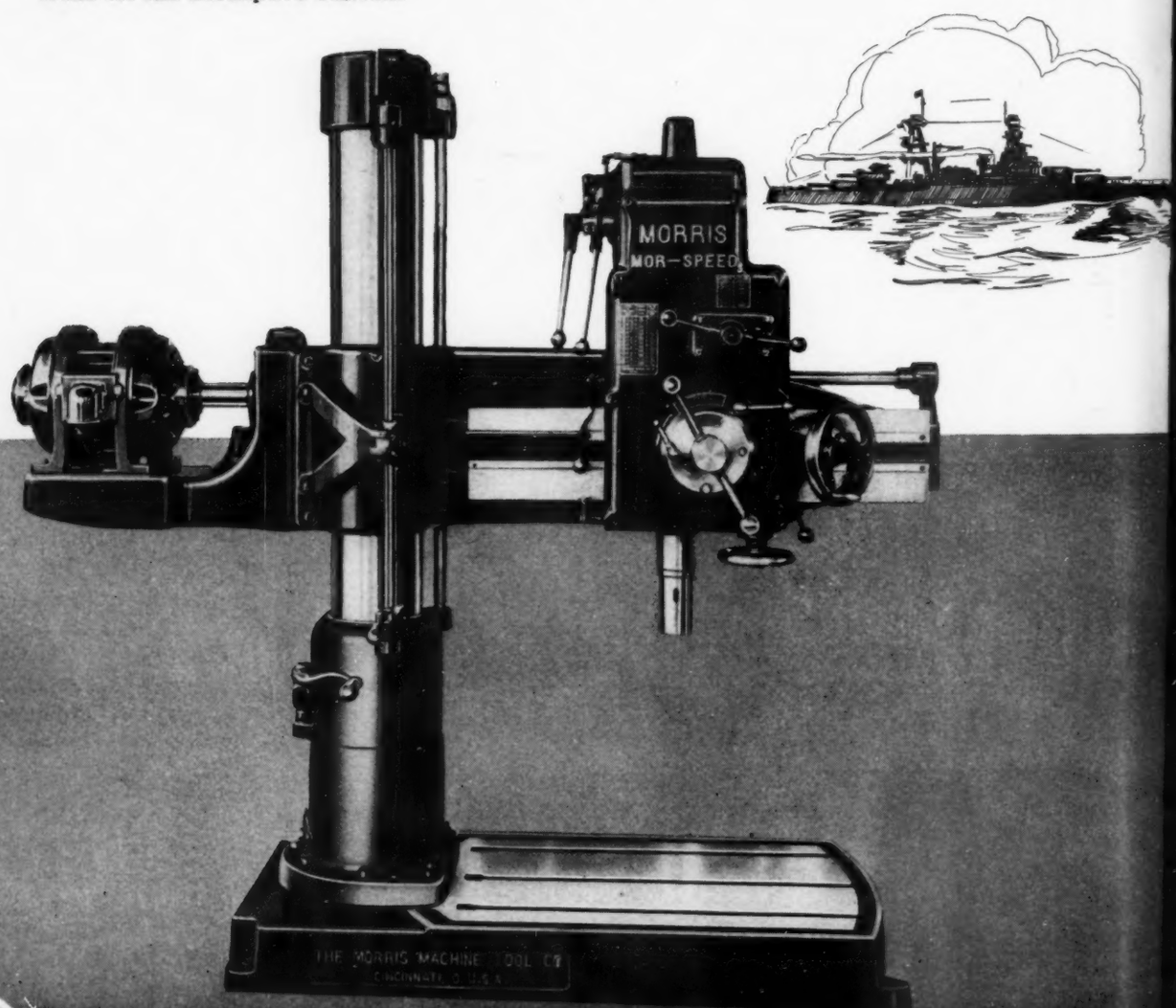
HELP MAINTAIN SEA POWER

● In the machine shop of some of the Battleships—in the shipyards and in many of the plants furnishing parts for our vast Navy, Morris Mor-Speed Radials are performing drilling, boring, facing and tapping operations that keep our Battleships ready for instant action.

Long after this present conflict is over Morris Mor-Speed Radials will still be on the job—maintaining ships and navy equipment in "tip-top" shape.

Mor-Speed Radials are designed and built for high speed production and long carefree service. Centralized control, power, ruggedness and ease of operation are inherent qualities of all Morris Radials. They are features which will keep Mor-Speed Radials producing this year—next year and for many years to come.

Write for full descriptive bulletin.



Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI, OHIO

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

since 1892

ENGINE TOOL ROOM AUTOMATIC LATHES

SPEEDING THINGS UP with two carboloy tools in four-way tool block and six high-speed tools in special tool plate on rear rest. This 18″ Lodge & Shipley Manufacturing Lathe, with multiple length stops and multiple diameter stops, brings speed and accuracy to the job.

ANNOUNCING THE NEW Dinhofer PATENTED DIAMOND WHEEL DRESSER

. . . assuring faster, finer, chatterless work at lower cost . . . an outstanding development by one of the largest diamond polishing plants in the U. S. A.

A $50 diamond in this new wheel dresser does more work than that ordinarily expected of a diamond costing $100—and it does finer, better work in much less time. The important features of the new Dinhofer Patented Dressers are the use of a high quality diamond, the way in which it is polished and the method employed for securing the diamond in the holder.

The use of a high quality diamond makes possible a better point and insures greatly increased service life. This fact has been demonstrated in every day use.

The diamond is polished in octahedral shape giving it 6 sharp points which can be readily changed from one to another. As one point becomes worn, another is available until all 6 points have been used. Each point that is exposed is in pyramidical form giving it extra strength. This insures a finer, more efficient job at a big saving.

The unique method employed for supporting the diamond makes it possible for any one to reset it in a few seconds time—no skilled diamond setter is necessary—no delays going to the tool crib for another dresser. When a point is worn down the operator at the machine can reset it to another point in less than one minute. There's always another point ready to use on the Dinhofer.

Experience, too, has demonstrated that there is no chatter whatsoever with this new tool, hence it can be depended on for highest accuracy in wheel dressing.

The new Dinhofer Patented Diamond Wheel Dresser is an outstanding contribution to high production because it insures longer wheel service between dressings and saves dressing time. Grinding wheels can be kept in more continuous productive operation when they are dressed with the Dinhofer.

This new wheel dresser is available in sizes for dressing all standard makes of grinding wheels of all grades and grits.

The Diamond in the Dinhofer Patented Diamond Wheel Dresser is polished in our own factory which is one of the largest in the United States.

Investigate today. Ask for details of our 30-DAY TRIAL offer which will enable you to prove the outstanding performance of this NEW tool on your own wheels. Samples will be sent to accredited houses on approval.

Dinhofer U.S. Pat. 2270420 2275511 2275512

Dinhofer CORPORATION, 599 Broadway, New York

A FEW SECONDS WITH THIS MAN MEANS EXTRA YEARS OF LIFE FOR ROTATING PARTS

THAT'S all it takes—just a few seconds—to insure longer, quieter, more efficient operation for almost any high-speed rotating part. The secret lies in eliminating vibration, principal cause of wear and failure.

The balancing of these parts was once a tedious and costly procedure. Now it is done so quickly and economically that no manufacturer should penalize his product by permitting the presence of unbalance to shorten the life of vital parts.

Using the radio principle of amplification, Gisholt Balancing Machines locate and measure unbalance vibrations to a degree of accuracy that is almost unbelievable—within 25 millionths of an inch. Yet, these machines are simplicity itself to operate.

The subject of balancing is interestingly treated in an illustrated 32-page booklet. Your copy will be sent on request. Gisholt Machine Company, 1201 East Washington Ave., Madison, Wisconsin.

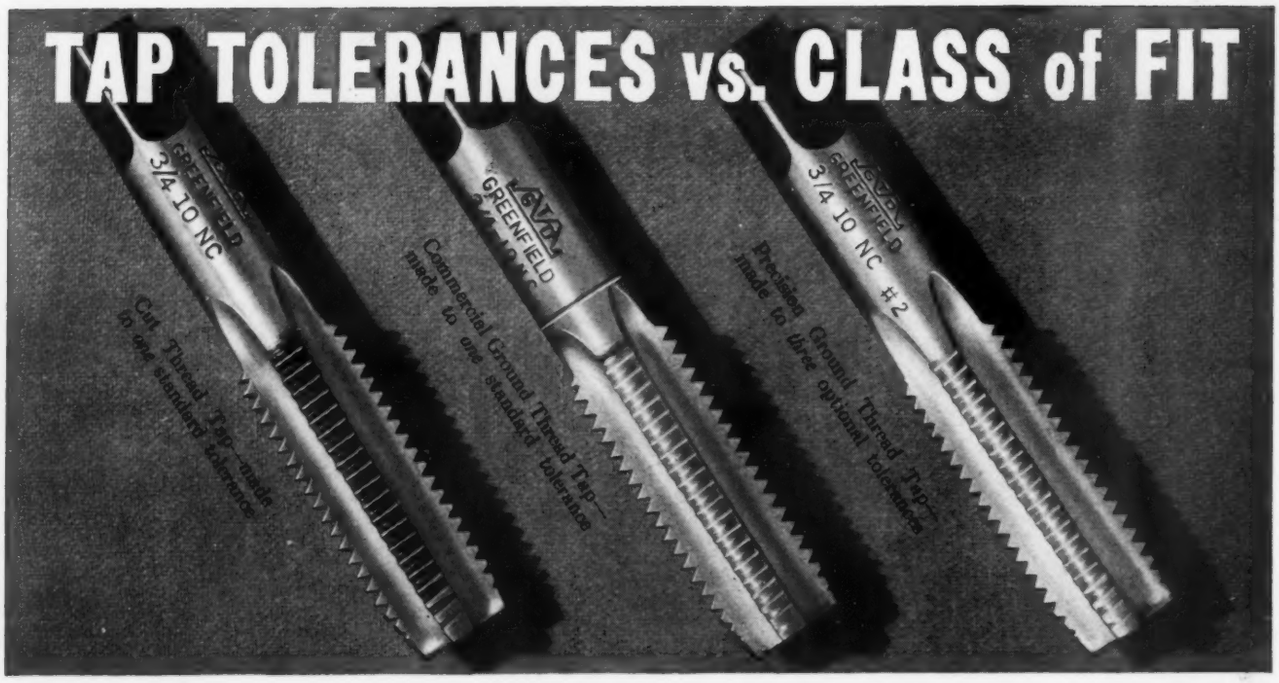
LOOK AHEAD—KEEP AHEAD—WITH GISHOLT IMPROVEMENTS

Dynetric Balancing Machines

GISHOLT

TURRET LATHES ★ AUTOMATIC LATHES ★ BALANCING MACHINES

TAP TOLERANCES vs. CLASS of FIT


GTD GREENFIELD 3/4 10 NC
Cut Thread Tap—made to one standard tolerance
GTD GREENFIELD
Commercial Ground Thread Tap—made to one standard tolerance
GTD GREENFIELD 3/4 10 NC #2
Precision Ground Thread Tap—made to three optional tolerances

A common source of confusion in tapping is failure to distinguish between CLASS of FIT as applied to the PRODUCT, and PITCH DIAMETER LIMITS as applied to PRECISION GROUND THREAD TAPS. The cause of this confusion doubtless is the fact that both terms involve the use of a similar, but not identical, series of numbers, and that the corresponding numbers have no direct relationship.

CLASS of Work FITS or "Screw Thread Assemblies" are:

No. 1—"Loose" No. 2—"Free"
No. 3—"Medium" No. 4—"Close"

Optional Pitch Diameter LIMITS or TOLERANCES of Precision Ground Thread Taps are: No. 01, No. 1, No. 2.

The table at the right indicates the taps which normally will produce Class 2 and 3 Fits, the ones most commonly used. Ordinarily, when using Precision Ground Thread Taps it is best to determine what screw assembly fit is required, then the Tap to produce threads for that fit may be selected by trial from the optional tolerances available.

Size	Threads per Inch			Class	
	NC	NF	NS	2	3
¼	20	..	..	Cut	CG
	..	28	..	Cut	PG 2
5/16	18	..	..	Cut	CG
	..	24	..	Cut	PG 2
⅜	16	..	..	Cut	CG
	..	24	..	Cut	PG 2
7/16	14	..	..	Cut	CG
	..	20	..	Cut	CG
½	13	..	..	Cut	CG
	..	20	..	Cut	CG
9/16	12	..	..	Cut	CG
	..	18	..	Cut	CG
⅝	11	..	..	Cut	CG
	..	18	..	Cut	CG
11/16	..	..	11	Cut	CG
	..	..	16	Cut	CG
¾	10	..	..	Cut	CG
	..	16	..	Cut	CG
⅞	9	..	..	Cut	CG
	..	14	..	CG	CG
	..	..	18	CG	CG
1	8	..	..	Cut	CG
	..	14	..	CG	CG
1 ⅛	7	..	..	Cut	CG
	..	12	..	CG	CG
1 ¼	7	..	..	Cut	CG
	..	12	..	CG	CG
1 ⅜	6	..	..	Cut	CG
	..	12	..	CG	CG
1 ½	6	..	..	Cut	CG
	..	12	..	CG	CG

Size	Threads per Inch			Class	
	NC	NF	NS	2	3
0	..	80	..	PG 1	PG 1
1	64	..	..	PG 1	PG 1
	..	72	..	PG 1	PG 1
	..	..	56	PG 1	PG 1
2	56	..	..	PG 1	PG 1
	..	64	..	PG 1	PG 1
3	48	..	..	CG	PG 1
	..	56	..	CG	PG 1
4	40	..	..	CG	PG 1
	..	48	..	CG	PG 1
	..	..	36	CG	PG 1
5	40	..	..	CG	PG 1
	..	44	..	CG	PG 1
6	32	..	..	CG	PG 1
	..	40	..	CG	PG 1
8	32	..	..	CG	PG 1
	..	36	..		PG 1
10	24	..	..		PG 1
	..	32	..	Cut	PG 1
12	24	..	..	or	PG 1
	..	28	..	CG	PG 1
14	..	..	20		PG 1
	..	..	24		PG 1

SYMBOLS

CUT—Cut thread taps, either in carbon or high speed steel.

CG—Commercial ground thread taps in high speed steel. See Standard Tables.

PG—Precision ground thread taps.

This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD • MASSACHUSETTS

GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONTARIO

GTD GREENFIELD

TAPS • DIES • GAGES • TWIST DRILLS • REAMERS • SCREW PLATES • PIPE TOOLS

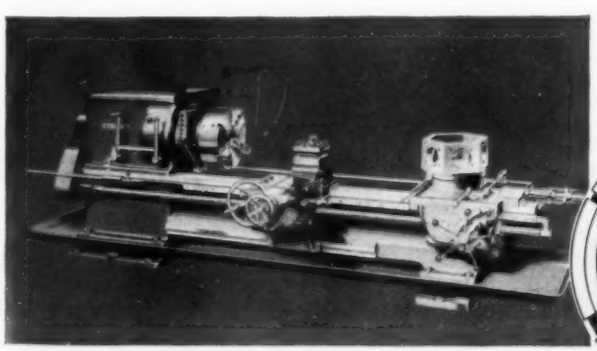
28 Days Make a Difference!

A NEW PLANT · A NEW MACHINE TO SPEED VICTORY

Just 28 days elapsed between the taking of these two photographs—from ground-breaking to new structure for the 50,000 square foot addition to the Gisholt Machine Company's Northern Works.

Days, hours, even minutes count now!

Rushed to completion in record time, this new addition to the Gisholt plant will provide facilities for a new department to be devoted exclusively to the manufacture of large turret lathes in two sizes. Even as you read this, we will be beginning to produce these machines in very large quantities to meet the urgent demands for more machine tools. Watch for a later announcement with regard to delivery dates. Gisholt Machine Company, 1201 Washington Avenue, Madison, Wisconsin.



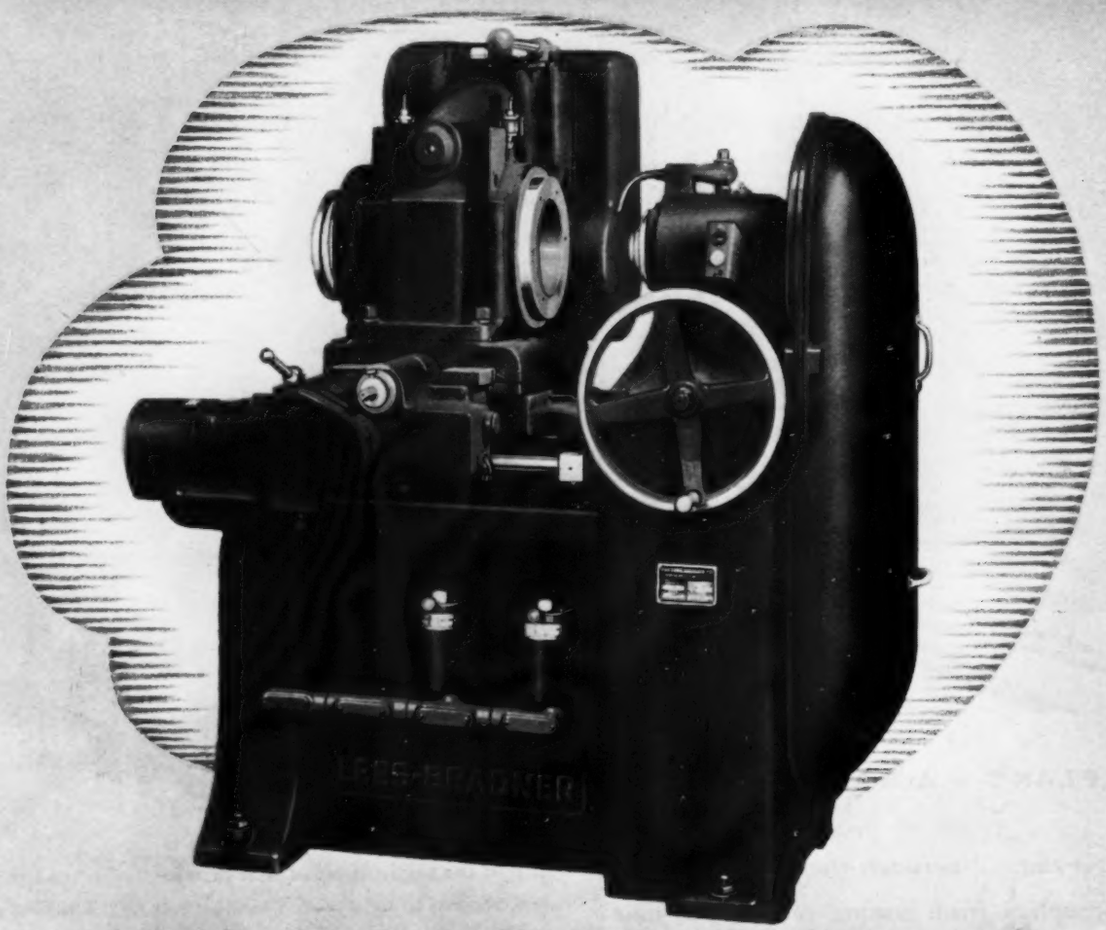
THE NEW TURRET LATHES—to be known as the 3-R and 4-R, are modifications of the Gisholt 3-L and 4-L Heavy Duty Turret Lathes. (5¼″ and 9¼″ spindle bores; 21″ and 24″ chucks; 28½″ and 31″ swings.) Essential industries requiring machines of these sizes should place their names on our list *now* to receive literature when ready.

GISHOLT

Look Ahead—Keep Ahead—With Gisholt Improvements in Metal Turning

TURRET LATHES · AUTOMATIC LATHES · BALANCING MACHINES

The NEW High Production Automatic THREAD MILLER



LEES-BRADNER'S MODEL 40

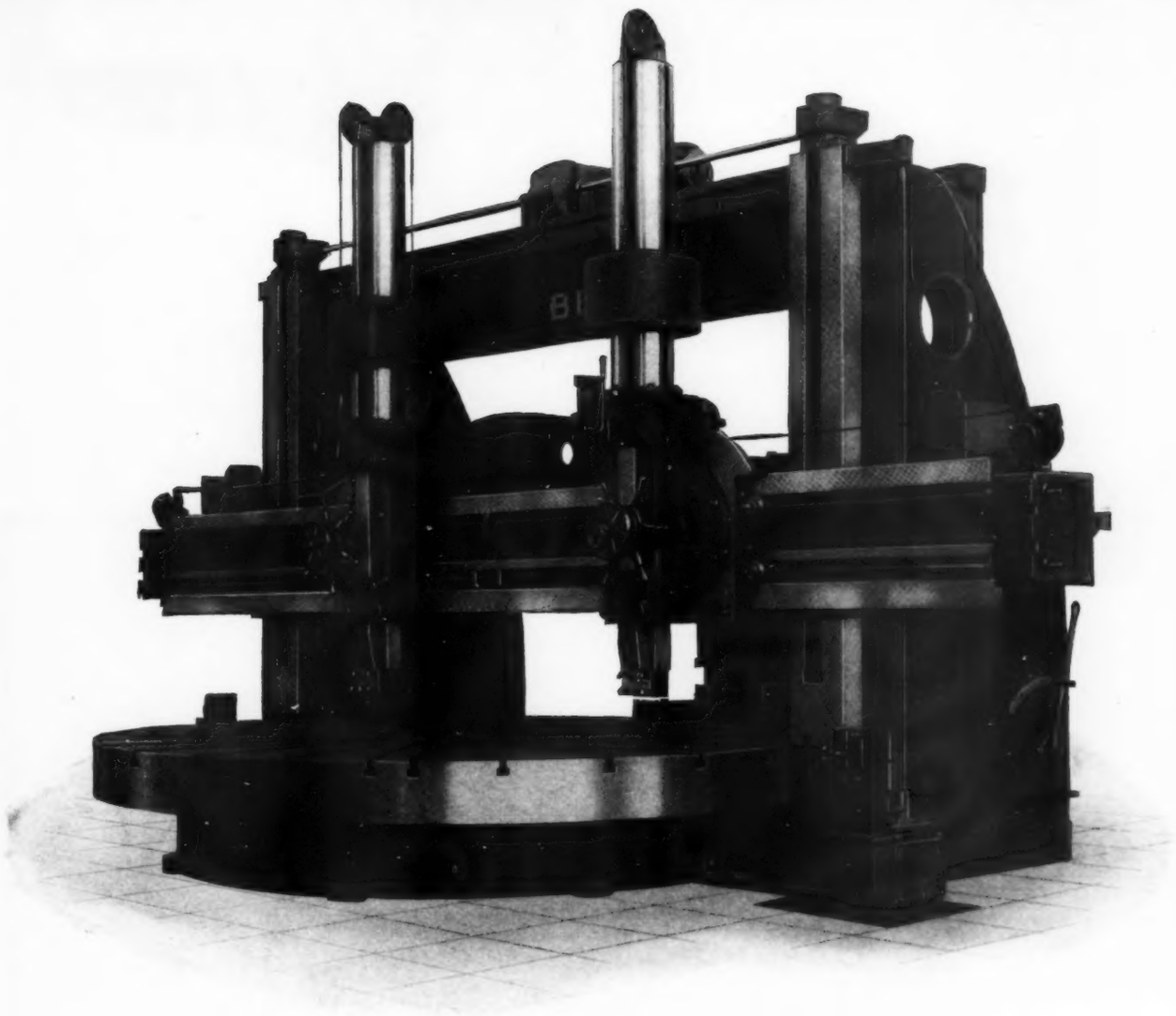
Designed and developed by an organization intimately acquainted with the needs of mass production, this rugged machine is establishing new highs in the field of precision threading.

Extreme simplicity of operation and automatic control eliminates need for highly trained, skilled labor.

The LEES-BRADNER Company

CLEVELAND, OHIO, U.S.A.

Here is another new
BETTS BORING MILL
designed and built for 24 hour service

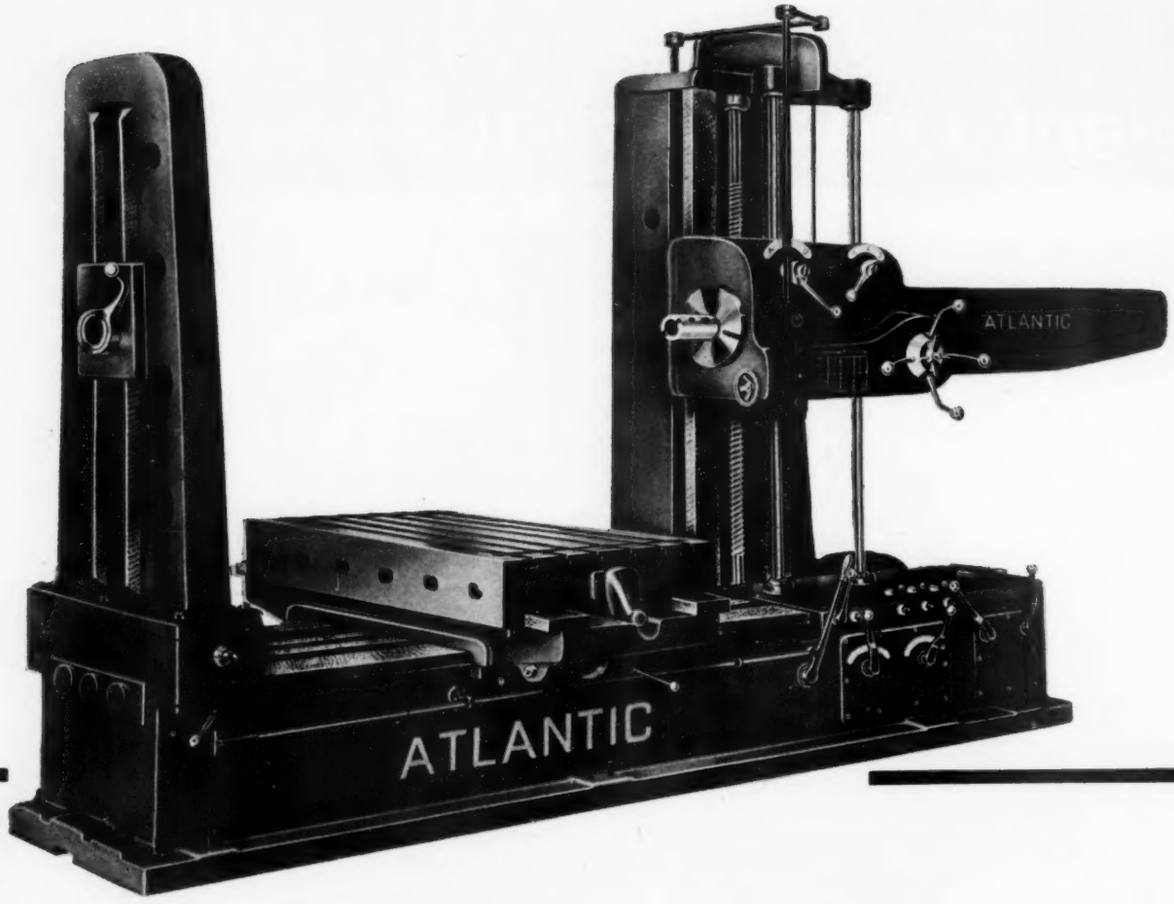


Ask any of the defense contractors
what they think of

BETTS BORING MILLS

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK



3½"—4"—5" SPINDLE
HEAVY DUTY—PRECISION TYPE

HORIZONTAL BORING MACHINES

Designed for Accurate Work on Armor Plate, Armor Steel Castings and Similar Materials....

Reasonably Prompt Deliveries

ATLANTIC MACHINERY CORPORATION

149 BROADWAY **NEW YORK, N. Y.**

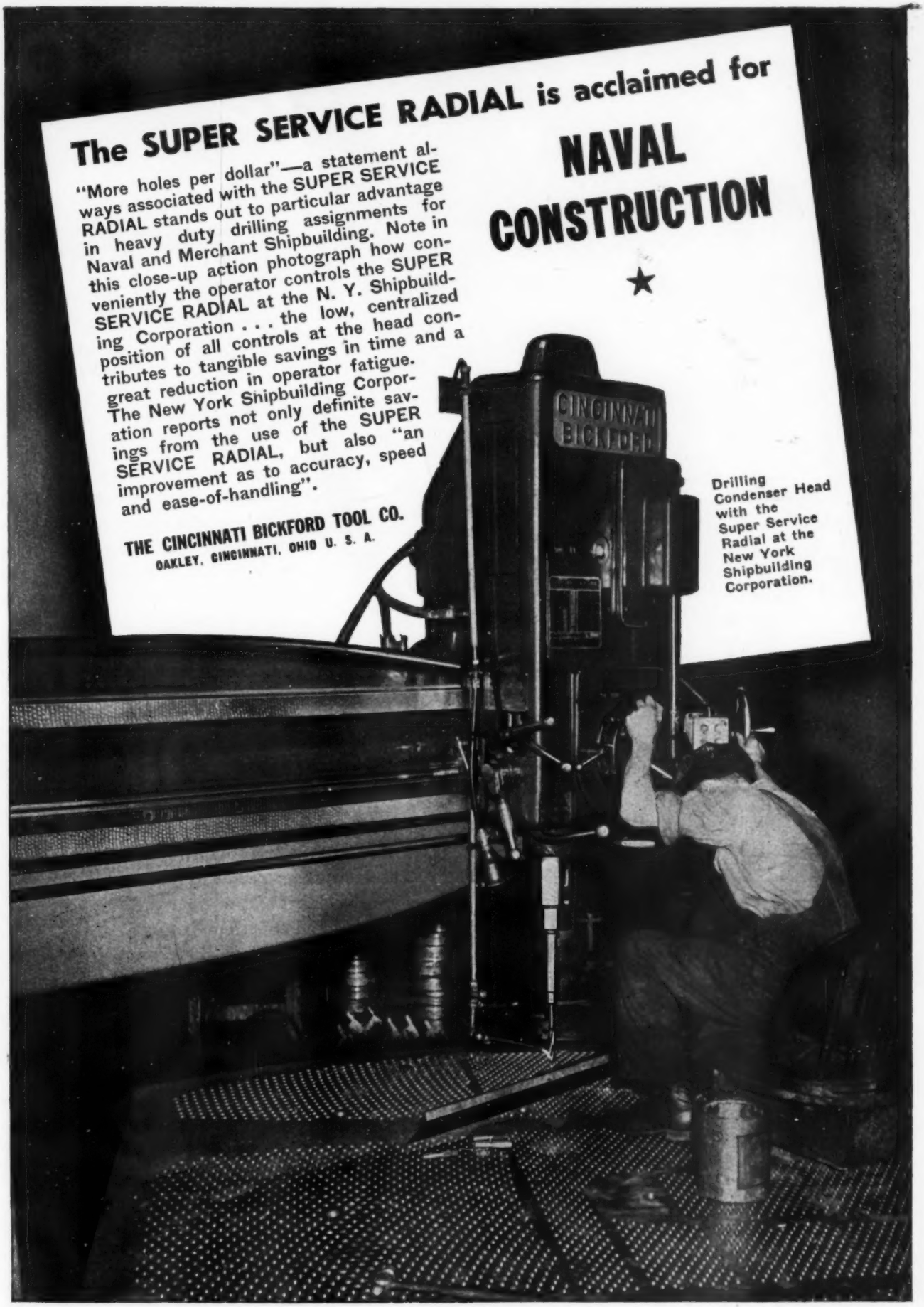
The SUPER SERVICE RADIAL is acclaimed for

NAVAL CONSTRUCTION

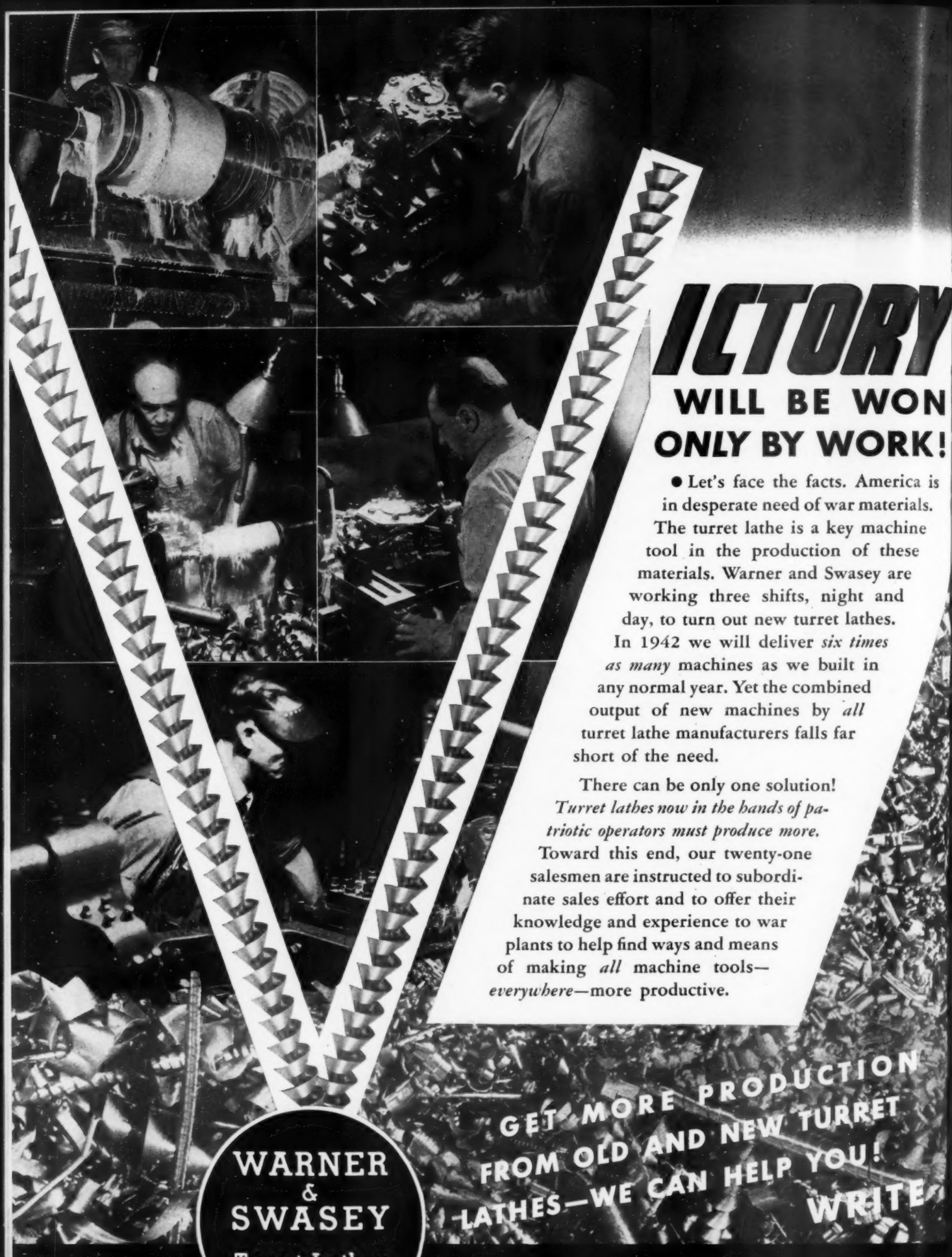
★

"More holes per dollar"—a statement always associated with the SUPER SERVICE RADIAL stands out to particular advantage in heavy duty drilling assignments for Naval and Merchant Shipbuilding. Note in this close-up action photograph how conveniently the operator controls the SUPER SERVICE RADIAL at the N. Y. Shipbuilding Corporation . . . the low, centralized position of all controls at the head contributes to tangible savings in time and a great reduction in operator fatigue. The New York Shipbuilding Corporation reports not only definite savings from the use of the SUPER SERVICE RADIAL, but also "an improvement as to accuracy, speed and ease-of-handling".

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY, CINCINNATI, OHIO U. S. A.



Drilling Condenser Head with the Super Service Radial at the New York Shipbuilding Corporation.



ICTORY

WILL BE WON ONLY BY WORK!

● Let's face the facts. America is in desperate need of war materials. The turret lathe is a key machine tool in the production of these materials. Warner and Swasey are working three shifts, night and day, to turn out new turret lathes. In 1942 we will deliver *six times as many* machines as we built in any normal year. Yet the combined output of new machines by *all* turret lathe manufacturers falls far short of the need.

There can be only one solution! *Turret lathes now in the hands of patriotic operators must produce more.* Toward this end, our twenty-one salesmen are instructed to subordinate sales effort and to offer their knowledge and experience to war plants to help find ways and means of making *all* machine tools—*everywhere*—more productive.

GET MORE PRODUCTION FROM OLD AND NEW TURRET LATHES—WE CAN HELP YOU! WRITE

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . . WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

GEORGE P. LONGABAUGH

SYSTEMATIC SUBCONTRACTING

Westinghouse Electric & Manufacturing Company has carried subcontracting so far that it has been necessary to set up a centralized system to control it. As now used, this control includes a master file of subcontracting facilities, a uniform method of inspecting parts in subcontracting plants and a well organized follow-up system. George P. Longabaugh, manufacturing engineer, Headquarters Subcontracting Staff, tells all about it on page 271.

DURAL IS DIFFERENT

Automobile manufacturers are fast learning that while sheet aluminum can be press worked, the metal flow differs from that of steel. Given the suitable equipment, however, dural can be worked, even deep drawn, with good results. On page 285 Charles C. Misfeldt tells about a process for deep drawing aluminum in the plant of one of our leading aircraft manufacturers.

HEAT-TREATING JACKS

Last number we told of methods of machining jack parts. A second article describes how these same parts are heat-treated. The equipment used and the procedure followed is explained fully on page 296.

TOOTH THICKNESS

When using a gear-tooth caliper it is necessary to turn the outside diameter of the blank to a close tolerance and with a smooth finish. That is, when the conventional method of measurement is used. But Clyde Young, Electro-Motive Corporation, has developed a method of using this instrument independent of the outside diameter. He describes his method on page 278.

BORING BARS AND TOOLHOLDERS

The picture spreads on tooling by John G. Jergens, Cleveland Pneumatic Tool Company, have made a hit with production men. We are glad, therefore, to add another pair of pages to our previously published information on the subject. Turn to pages 280 and 281 for sketches of boring bars and some practical toolholders.

MORE ON ABRASIVE CUTTING

H. G. Robinson, Andrew C. Campbell Division, American Chain & Cable Company, contributes Part II on abrasive cutting. Beginning page 275 he tells how to use this process and points out particularly some new developments that have tripled the capacity of abrasive wheels used in cutting off.

CHARLES C. MISFELDT

CLYDE A. YOUNG

FRED A. FIRNHABER

FOREMEN IN THE MAKING

Machine shop apprentices have made fine records for themselves in the past. They have proved themselves to be excellent supervisory material and are today found in key positions throughout industry. The Landis Tool Company has organized its apprenticeship course on the basis that the boys who complete it are of supervisory timber as explained by Fred A. Firnhaber, Landis apprentice supervisor, on page 282.

WELDING STAINLESS

The combination of stainless steel and a pressure vessel makes a tough welding job. However, it is being done today by the Edgemoor Iron Works to meet code requirements. D. H. Sandberg, Wilson Welder & Metals Company, tells how on page 293.

EMERGENCY STEELS

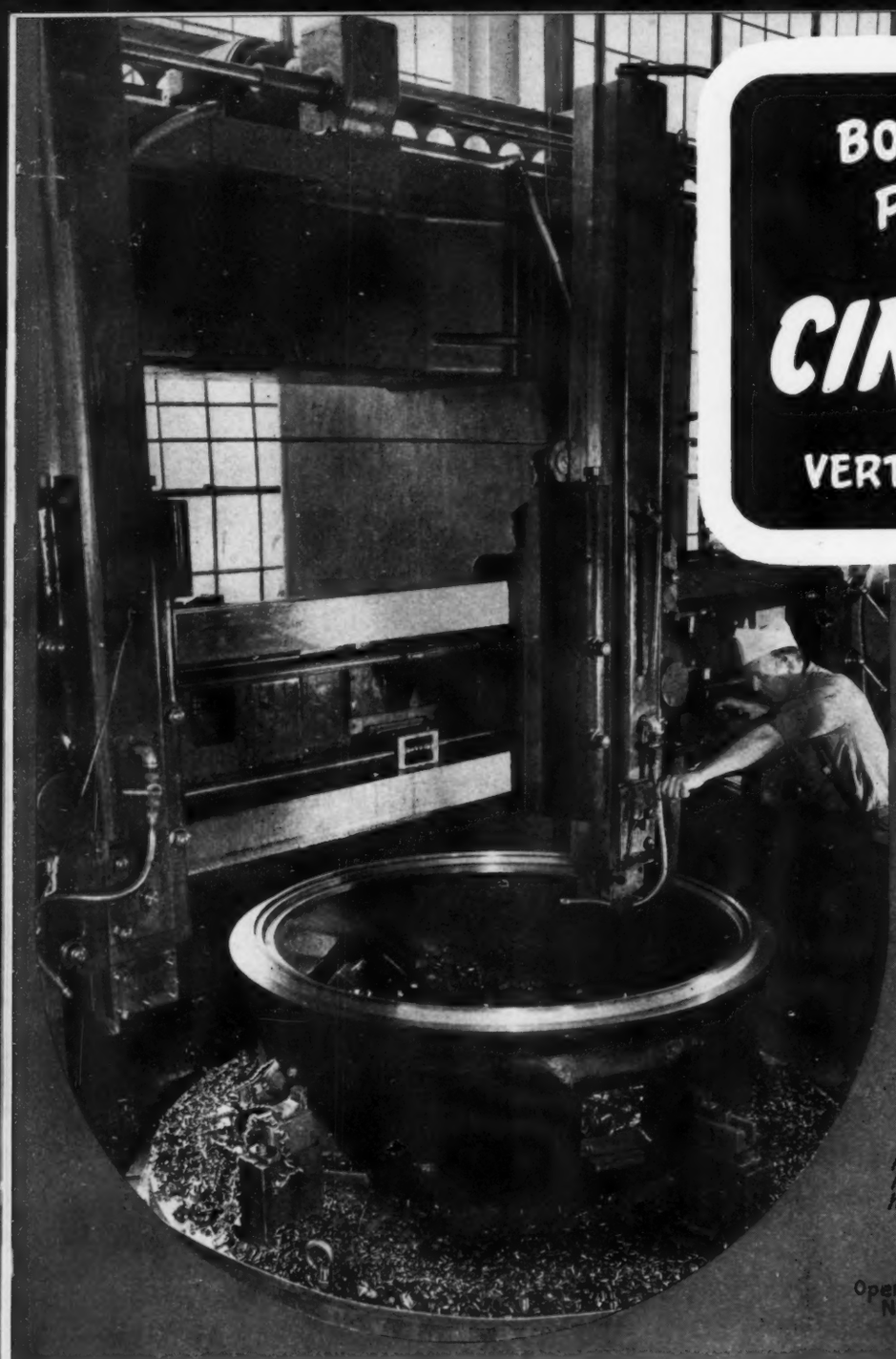
Because of the shortage of some alloying elements the War Production Board has set up a list of emergency steel specifications. We are devoting our reference book sheets to these steels, giving SAE and AISI equivalents in each case. See pages 301 and 303.

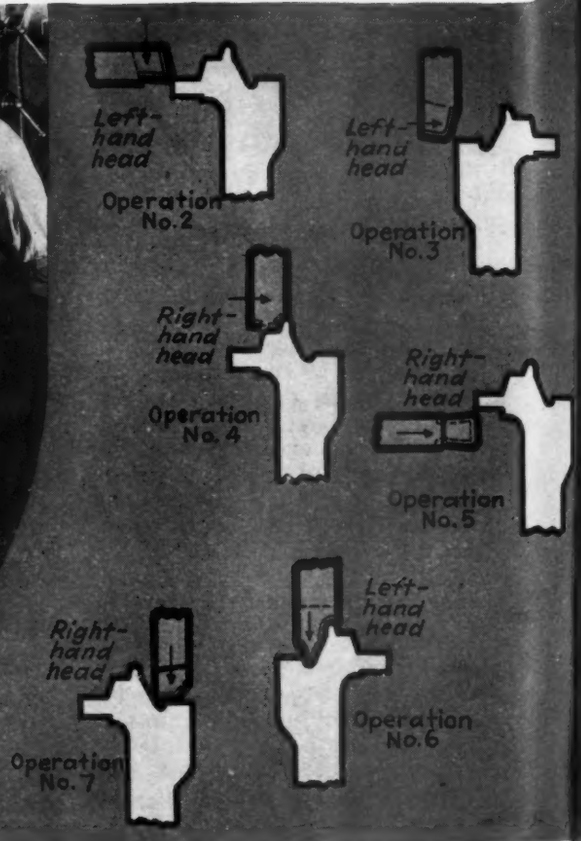
COMING

Many machine tools and other metalworking equipment use hydraulic drive. Together with other elements of machine operation, these systems must be properly maintained to secure uninterrupted output. An article to appear soon will give some practical instructions for the care of hydraulic systems.

BOOSTING TANK PRODUCTION

CINCINNATI Hypro VERTICAL BORING MILL





This Cincinnati Boring Mill has stamina and capacity for high speeds and feeds establishing it as one of the important links in the modern production chain at one of America's leading tank plants.

It is shown machining the lower rim of a cast armor steel turret at cutting speeds up to 150 ft. per min. with carbide tools.

The various operations performed at one setting are illustrated in the sketches and speak for themselves.

For your vertical boring and turning operations use a Cincinnati Hypro Boring Mill for high production . . . dependable accuracy . . . versatility . . . and ease of operation.

OPERATION SEQUENCE

No. 1 Face rim surface (not shown)
No. 2 Turn O.D. and I.D.
No. 3 Face to contour—3 cuts with R. & L. hand heads
No. 4 Form radius
No. 5 Undercut
No. 6 Form flank of contour and gully
No. 7 Finish face and chamfer into gully

THE CINCINNATI PLANER CO.

Cincinnati, Ohio

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

Included in the Westinghouse subcontracting program have been large numbers of tools and gages, as well as special machines, large fabricated parts and many assemblies

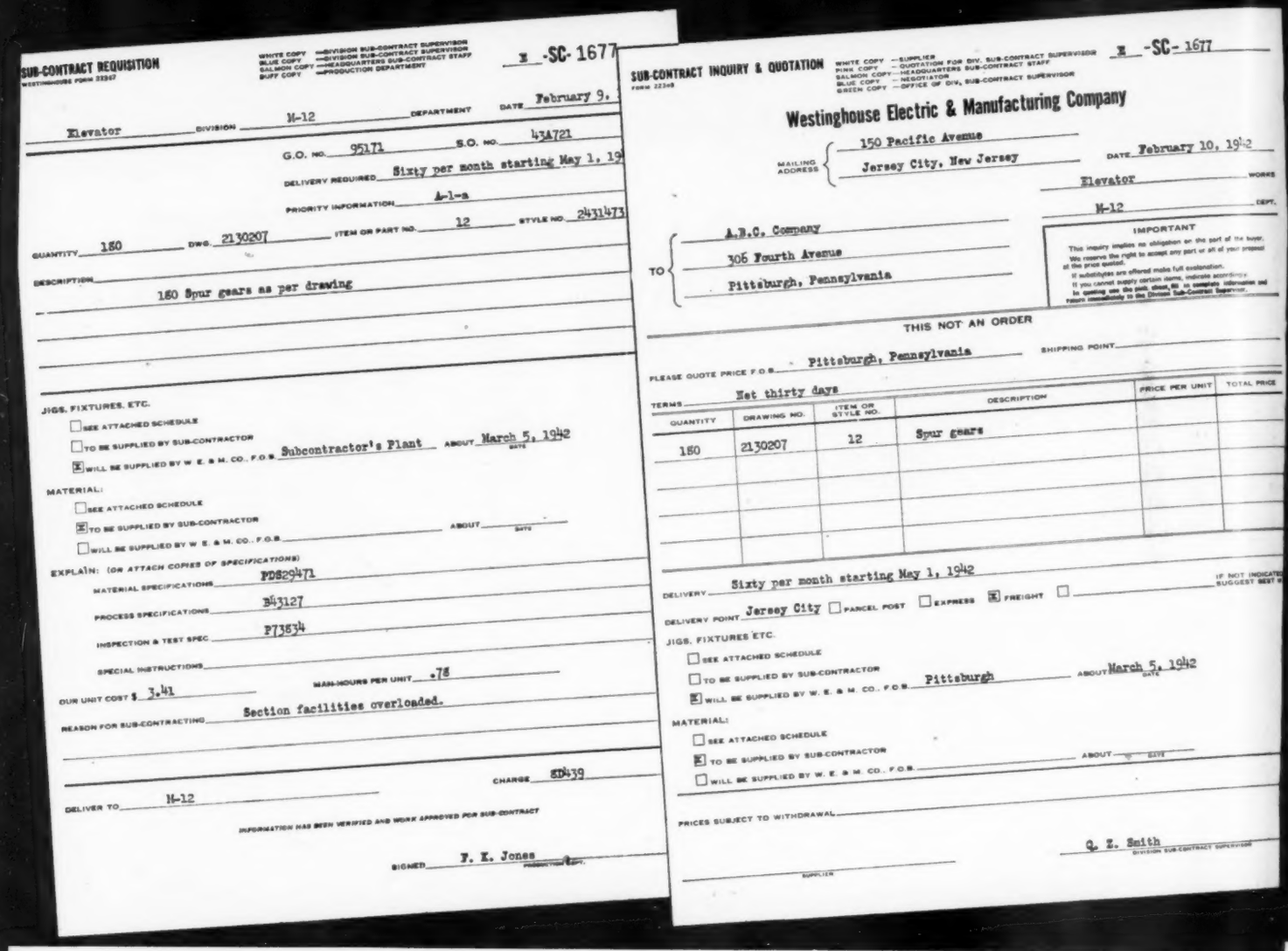
How We Subcontract

BY GEORGE P. LONGABAUGH, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Subcontracting at Westinghouse has grown from a minor start into a major activity covering twenty-four states and involves many million man-hours of work

PRESSURE OF WAR PRODUCTION requirements has made necessary extensive subcontracting in most of the divisions of Westinghouse Electric & Manufacturing Company, where its use has been feasible. Unfortunately, the mere extension of subcontracting does not offer the easy solution we should like. Included in the subcontracting program are tools as well as production parts and assemblies ranging from small tool bits costing less than 50 cents to special machines and large fabricated parts and assemblies costing many thousands of dollars.

The Westinghouse organization is divided into a number of divisions, with a manager responsible for the op-



SUB-CONTRACT REQUISITION

Elevator DIVISION M-12 DEPARTMENT DATE February 9,

G.O. NO. 95171 S.O. NO. 434721

DELIVERY REQUIRED Sixty per month starting May 1, 19

PRIORITY INFORMATION A-1-a

QUANTITY 150 DWG. 2130207 ITEM OR PART NO. 12 STYLE NO. 2431473

DESCRIPTION 150 Spur gears as per drawing

JIGS, FIXTURES, ETC.

☐ SEE ATTACHED SCHEDULE

☐ TO BE SUPPLIED BY SUB-CONTRACTOR

☒ WILL BE SUPPLIED BY W. E. & M. CO., F.O.B. Subcontractor's Plant ABOUT March 5, 1942

MATERIAL:

☐ SEE ATTACHED SCHEDULE

☒ TO BE SUPPLIED BY SUB-CONTRACTOR

☐ WILL BE SUPPLIED BY W. E. & M. CO., F.O.B. ABOUT

EXPLAIN: (ON ATTACH COPIES OF SPECIFICATIONS)

MATERIAL SPECIFICATIONS PDS29471

PROCESS SPECIFICATIONS B43127

INSPECTION & TEST SPEC F73834

SPECIAL INSTRUCTIONS

OUR UNIT COST $ 3.41 MAN-HOURS PER UNIT .78

REASON FOR SUB-CONTRACTING Section facilities overloaded.

CHARGE 6D439

DELIVER TO M-12

INFORMATION HAS BEEN VERIFIED AND WORK APPROVED FOR SUB-CONTRACT

SIGNED F. K. Jones

SUB-CONTRACT INQUIRY & QUOTATION

Westinghouse Electric & Manufacturing Company

MAILING ADDRESS 150 Pacific Avenue, Jersey City, New Jersey

DATE February 10, 1942

Elevator WORKS

M-12 DEPT.

TO A.B.C. Company, 306 Fourth Avenue, Pittsburgh, Pennsylvania

IMPORTANT

THIS NOT AN ORDER

PLEASE QUOTE PRICE F.O.B. Pittsburgh, Pennsylvania SHIPPING POINT

TERMS Net thirty days

QUANTITY	DRAWING NO.	ITEM OR STYLE NO.	DESCRIPTION	PRICE PER UNIT	TOTAL PRICE
150	2130207	12	Spur gears		

DELIVERY Sixty per month starting May 1, 1942

DELIVERY POINT Jersey City ☐ PARCEL POST ☐ EXPRESS ☒ FREIGHT ☐

JIGS, FIXTURES ETC.

☐ SEE ATTACHED SCHEDULE

☐ TO BE SUPPLIED BY SUB-CONTRACTOR

☒ WILL BE SUPPLIED BY W. E. & M. CO., F.O.B. Pittsburgh ABOUT March 5, 1942

MATERIAL:

☐ SEE ATTACHED SCHEDULE

☒ TO BE SUPPLIED BY SUB-CONTRACTOR

☐ WILL BE SUPPLIED BY W. E. & M. CO., F.O.B. ABOUT

PRICES SUBJECT TO WITHDRAWAL

Q. Z. Smith

eration of each division. At the start of the defense program, subcontracting was handled in a more or less loose fashion, each division dealing with subcontracting as it saw fit. There was no attempt at uniform control. This resulted in a number of overlapping investigations and in duplication of effort.

Early in the program, subcontracting was used by some of the production departments of the various divisions as an "out" when they were up against it for some particular item. This provided temporary relief, but was not an accepted practice. Planning for subcontracting of parts or assemblies should be accompanied by a long look ahead, and scheduled like any other production item to give the most satisfactory results. Such a program gives the subcontractor an opportunity to plan how to fit the new product into his plant.

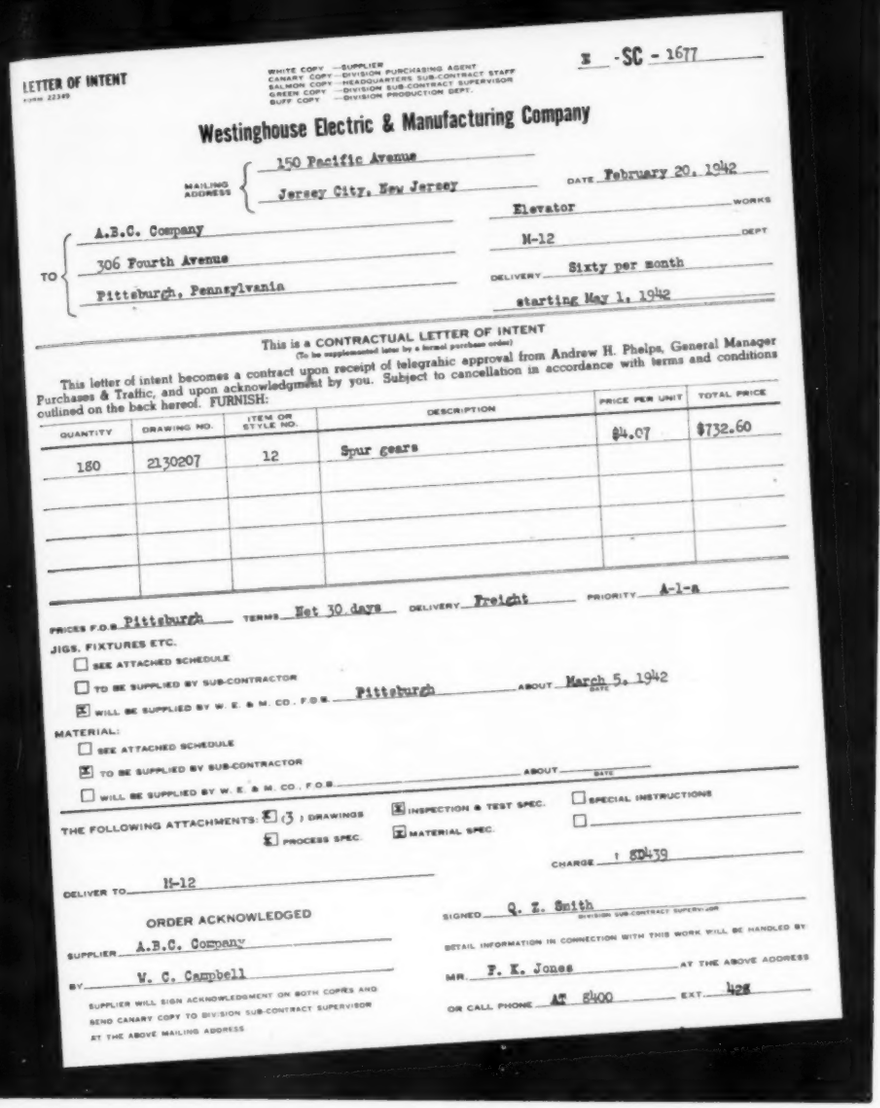
Whereas the most troublesome jobs were subcontracted in the beginning, this is not now our accepted practice. The present plan is to keep the difficult jobs in our own division, where they can be handled by experienced men. Careful planning in the beginning of a subcontracting program has saved many a headache later.

Duplication of effort can be avoided if complete information is secured when a potential subcontracting plant is surveyed. Information should be secured on available floor space, type of building, crane or lifting capacity, type and size of machine tools, kind of product made, workmen's and supervisory skill, and financial standing. With this information at hand, much time and effort is saved, and the possibility of asking for quotations from plants not equipped to handle particular items is eliminated.

Some time has been lost in visiting plants and securing information only on the parts in which a division is interested at a particular time. Often it is necessary to go back later to obtain a more complete story. When subcontractors are selected, much help can be given them in the way of complete information on operation line-ups, process specifications, complete blueprints, estimated man-hours, kind of labor used, or other assistance to aid them in getting started properly. This has been accomplished in some cases by having the subcontractor visit the division then doing the work, so he can familiarize himself with tooling and equipment used to produce the part that he is being asked to make on a subcontract.

In some cases, manufacturing engineers and shop men have been sent into the subcontractor's plant to aid him in getting started on an efficient basis so that he can produce parts at a reasonable cost. Engineers and workmen are cautioned that a comparatively simple job may seem difficult to the subcontractor, if he does not have all of the facts. When time has permitted, educational orders have been placed to allow the subcontractor to better study the parts or assemblies in his own plant.

Often, assistance has been given in helping the subcontractor to set up a reasonable cost to charge per hour on a given type of work, care being taken to allow the subcontractor to make a fair profit on the work he is doing. We have proceeded on the theory that if a subcontractor's price is unreasonable and he actually has the



LETTER OF INTENT

WHITE COPY —SUPPLIER
CANARY COPY —DIVISION PURCHASING AGENT
SALMON COPY —HEADQUARTERS SUB-CONTRACT STAFF
GREEN COPY —DIVISION SUB-CONTRACT SUPERVISOR
BUFF COPY —DIVISION PRODUCTION DEPT.

X -SC - 1677

Westinghouse Electric & Manufacturing Company

MAILING ADDRESS: 150 Pacific Avenue, Jersey City, New Jersey — DATE February 20, 1942

TO: A.B.C. Company, 306 Fourth Avenue, Pittsburgh, Pennsylvania — WORKS Elevator — DEPT M-12 — DELIVERY Sixty per month starting May 1, 1942

This is a CONTRACTUAL LETTER OF INTENT
(To be supplemented later by a formal purchase order)

This letter of intent becomes a contract upon receipt of telegrahic approval from Andrew H. Phelps, General Manager Purchases & Traffic, and upon acknowledgment by you. Subject to cancellation in accordance with terms and conditions outlined on the back hereof. FURNISH:

QUANTITY	DRAWING NO.	ITEM OR STYLE NO.	DESCRIPTION	PRICE PER UNIT	TOTAL PRICE
180	2130207	12	Spur gears	$4.07	$732.60

PRICES F.O.B. Pittsburgh TERMS Net 30 days DELIVERY Freight PRIORITY A-1-a

JIGS, FIXTURES ETC.
☐ SEE ATTACHED SCHEDULE
☐ TO BE SUPPLIED BY SUB-CONTRACTOR
☒ WILL BE SUPPLIED BY W. E. & M. CO., F.O.B. Pittsburgh ABOUT March 5, 1942 (DATE)

MATERIAL:
☐ SEE ATTACHED SCHEDULE
☒ TO BE SUPPLIED BY SUB-CONTRACTOR
☐ WILL BE SUPPLIED BY W. E. & M. CO., F.O.B. ABOUT (DATE)

THE FOLLOWING ATTACHMENTS: ☒ (3) DRAWINGS ☒ INSPECTION & TEST SPEC. ☐ SPECIAL INSTRUCTIONS
☒ PROCESS SPEC. ☒ MATERIAL SPEC. ☐

CHARGE ↑ 8439

DELIVER TO M-12

ORDER ACKNOWLEDGED

SUPPLIER A.B.C. Company

BY W. C. Campbell

SUPPLIER WILL SIGN ACKNOWLEDGMENT ON BOTH COPIES AND SEND CANARY COPY TO DIVISION SUB-CONTRACT SUPERVISOR AT THE ABOVE MAILING ADDRESS

SIGNED Q. Z. Smith (DIVISION SUB-CONTRACT SUPERVISOR)

DETAIL INFORMATION IN CONNECTION WITH THIS WORK WILL BE HANDLED BY MR. F. K. Jones AT THE ABOVE ADDRESS OR CALL PHONE At 8400 EXT. 428

When the production supervisor of a manufacturing division has determined a need for subcontracting specific work, he issues a subcontract requisition like that at far left. Four copies, each on a different color paper to facilitate distribution, are sent out as indicated at the top. The identification number on this form is shown on all other forms relating to this particular subcontract, in order that files covering the order may be complete. Upon receipt of this form, the division subcontract supervisor goes to work to locate a subcontractor who can do the job satisfactorily

Negotiation of a subcontract for a specific item is initiated with the center form, placing pertinent information carried over from the subcontract requisition in the hands of potential subcontractors. The form serves to keep quotations uniform, and helps keep interested parties advised of the progress of the subcontracting order

A contractual letter of intent is issued when the division subcontract supervisor has completed negotiations satisfactorily. This letter of intent becomes contractual upon receipt of telegraphic authorization from the company's purchasing department. It is supplemented later by a formal purchase order

equipment to produce the item, he either does not understand the job or he does not want the work.

These conditions being recognized, the following plan was adopted in order to facilitate an organized effort in placing subcontracts:

1. A group of manufacturing engineers was set up at the headquarters office to analyze, investigate and tentatively evaluate possible facilities in various areas of the country, and to make them known to the interested manufacturing divisions.

2. Each division manager designated a division subcontract supervisor, part time or full time as needed, with such personnel under his direction or available to him as was required.

3. By using the experienced personnel available to them in their divisions, the division subcontract supervisors operate through advice of requirements from their production departments and control the final analysis of the competence of a facility to perform the specific work. The headquarters group of manufacturing engineers is on call to generally supervise and aid both the production departments and the division subcontract supervisors in performing these functions.

4. A uniform system exists: (*a*) to keep the division subcontract supervisor advised of competent facilities available; (*b*) to keep the headquarters group advised of the volume and type of work available in the divisions for subcontracting; (*c*) to expedite the placing of subcontracts, after satisfactory negotiations, by authorizing the division subcontract supervisor or his representative to issue a contractual letter of intent to be confirmed by the purchasing department with an official purchasing order; and (*d*) to provide standard forms with required copies to inform interested departments during inquiry, negotiation, and the placing of letters of intent.

5. The headquarters group prepares and distributes periodical progress information to the divisions, district sales offices, headquarters staff, and interested government agencies.

It is desirable that a duplication of effort be avoided in the handling of letters or other information regarding potential subcontractors, which might come in through a division office or through the headquarters office from any of the following sources: (*a*) headquarters and field offices of the Contract Distribution Branch of the War Production Board; (*b*) district sales offices; and (*c*) individual manufacturers. While the division which receives the inquiry might not be interested, one of the other divisions may be vitally interested in equipment of a particular nature. Also, the inquiry might be received by one division, and some experience might have been had concerning this manufacturer by one of the other divisions. The headquarters organization is able to advise whether this experience has been satisfactory or unsatisfactory.

Through the establishment of the headquarters indexing system, the headquarters staff is in a position to supply information on a large number of firms and facilities. If an inquiry proves interesting, and if it appears advisable that a visual investigation of the manufacturer's equipment and products be made, such an investigation is handled by the headquarters staff. This does not mean that any

division is prohibited from making a preliminary analysis; but if this is done, headquarters requests notification. The district sales office of a particular territory is also advised before an actual investigation is conducted in that territory.

After a preliminary investigation has been conducted, a report is sent to the interested division supervisor of subcontracting. If the report is favorable, and if the division subcontract supervisor has immediate use for the equipment offered, he makes the final analysis as to whether the facilities are competent for his particular division.

If further investigation is thought necessary, the headquarters organization is kept informed of progress so that the index can be kept as complete and up-to-date as possible. In all cases, the final decision on the competence of the facilities offered rests with the division subcontracting group.

The process of determining the need for subcontracting and specifying work to be subcontracted varies with the different divisions. In general, however, the scheduling of work and the supplying of manufacturing information, drawings and other specifications is the function of the production department of the division. Once the production supervisor has determined what is to be subcontracted, it is necessary that the division subcontract supervisor and his staff be provided with all pertinent information, in order to intelligently search for a source of supply.

To facilitate the accumulation of information essential to negotiating a subcontract for a specific item, a subcontract requisition form has been devised. It serves a dual function, in that it sets up an identification number which is carried through with the particular part or apparatus until it has been subcontracted, and it also provides a means of distribution of necessary information on one form. In order to keep the headquarters office informed of subcontracting activities, a copy of this form must be sent to the Pittsburgh office. With this exception, handling of the forms may be modified to suit any division's internal set-up.

When the subcontract requisition form has been prepared by the production department of a division and the necessary information has been turned over to the division subcontract supervisor, it becomes his task to find a subcontractor to produce the work. At this point a tie-in is made with the headquarters subcontracting staff. It is assumed that the division has approved the facilities of different subcontractors who are able to do such work as that outlined on the subcontract requisition, and is ready to contact a supplier with a definite job in mind.

This investigation of facilities for specific work may be tied in with the final analysis of the subcontractor's facilities. The division subcontract supervisor, having selected the different suppliers who are equipped to produce the needed part, uses the inquiry and quotation form shown to place pertinent information carried over from the subcontract requisition in the hands of potential subcontractors. By using this form, quotations are kept uniform and interested persons are kept advised of the progress of subcontracting of a particular part. The forms have all been made in multicolor in order to facilitate distribution.

Once the negotiations are satisfactorily completed, the division is ready to make a subcontract. This may be done on the customer's property, in a hotel room, or at some other place of meeting by issuing a contractual letter of intent, for which a separate form has been provided. This form again shows a place for the number which appeared on the original subcontract requisition, tying in the three forms and continuing the history of this particular contract from the point it originated to the placing of the work with the subcontractor.

The purchasing department of the company has requested that it be made a party to the subcontract by making it necessary that telegraphic authorization be received from that department before a letter of intent becomes contractual. The purpose of this procedure is mainly to afford a contact with the subcontracting concern which will exist after the national emergency has passed and those of the subcontracting group go on to other activities.

After the letter of intent has been placed with the subcontractor, it is the division subcontract supervisor's responsibility to see that the information is passed on to the division purchasing agent, so that he can issue a formal purchase order. With the sending of a copy of the purchase order to the headquarters subcontracting office, a complete record of the subcontracting of the particular part or tool is available in the headquarter's file. This file is the source of information for summary sheets for the headquarters offices, division records, records for district sales offices, and the Contract Distribution Branch of the War Production Board.

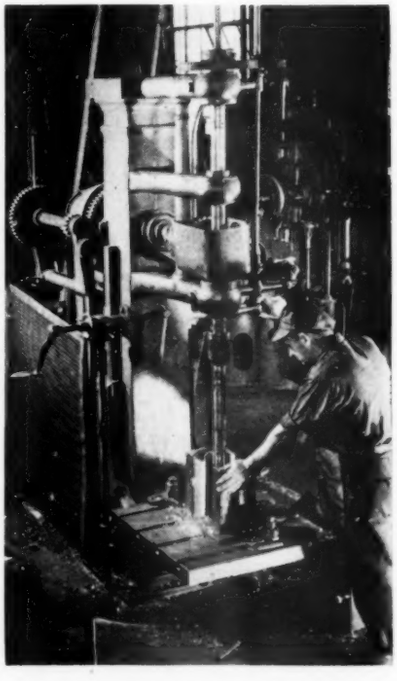
A Veteran Returns to Service

BY ARTHUR HAVENS

THIS DRILL PRESS was installed over 50 years ago in a New England railroad shop, and is still being used. Practically all the brasses for engine-truck and tender-truck journals are bored on it for locomotives repaired in this shop. The brasses are set in the fixture shown on the table, and the journal diameter turned with a boring tool in the piloted spindle extension. This may not be the best way to do this job, but it works.

With old locomotives being pulled out of storage, and new ones operating at maximum capacity, this locomotive shop needed every available machine. So the drill press was pressed into service. It had been retained in the shop as a museum piece, but found occasional use when other machines were busy.

The fact that this drill press could be used is certainly a compliment to pioneer machine tool builders. There is not a man in the shop who knows who built it or when it was installed. It has only the necessary essentials, all appended to the cast-iron center column. It's an "oldy" that never fails to draw attention of visitors.



Journal brasses must be bored true. This drill with a piloted tool does it.

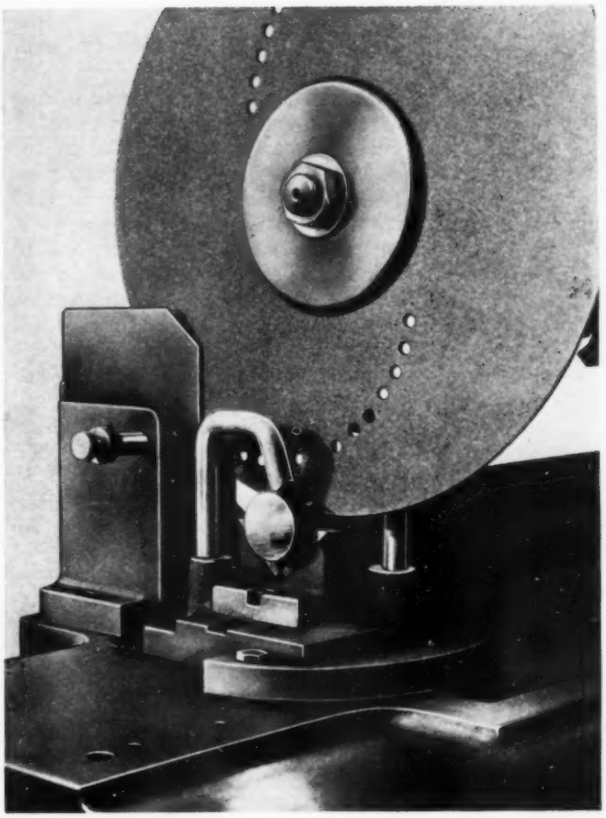


Fig. 4—Detail of a new type machine which combines wet cutting with ease of loading. The coolant box has a slot through which wheel revolves

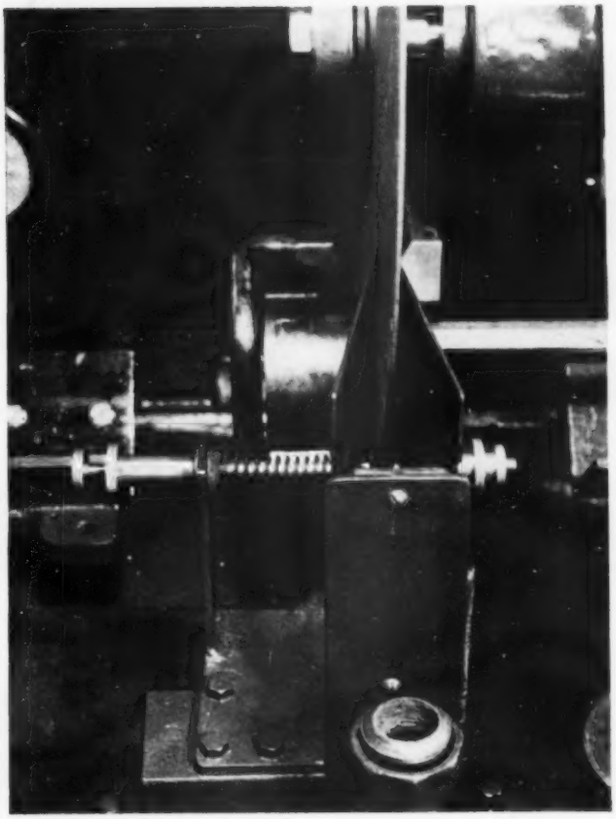


Fig. 5—The wings of the coolant box are adjustable and leave an even supply of coolant on each side of the wheel, helping it to retain its shape

How to Use Abrasive Cutting

BY H. G. ROBINSON, ANDREW C. CAMPBELL DIVISION OF AMERICAN CHAIN & CABLE COMPANY

New developments have tripled the capacity of abrasive wheels and made faster, more efficient production operations possible

CUTS OF THE HIGHEST QUALITY are made on practically all kinds of material by the submerged method of abrasive cutting described in the first article of this series. However, the placing of the work and the removal of the cut pieces is difficult because of the design of the coolant box.

Since this difficulty makes the submerged method of cutting impractical for most production work, a new type of machine was developed in which the abrasive wheel is fed radially downward.

The coolant box on this type of machine (Fig. 4) is a closed container with a narrow slot through which the abrasive wheel revolves. This container is kept filled with coolant either by direct connection to a supply system or by a volume type of pump, no pressure being necessary.

As the abrasive wheel passes through the top of the box, it picks up a certain amount of coolant on the sides and periphery of the wheel and forces this coolant into the cut with considerable velocity. The coolant tends to prevent the generation of heat and absorbs the small amount of heat that is developed. The effectiveness of this method is proved by the fact that thin wall tubing is cut off clean with practically no burr, showing that the metal is actually cut off rather than being partially heated and then removed while in a softened condition. The coolant box performs still another extremely important function, which affects the abrasive wheel primarily. An abrasive cutoff wheel is extremely sensitive to conditions that govern its shape at the cutting edge, particularly when wet cutting. If the coolant is not applied equally to both sides of the wheel, the periphery or cutting edge will wear either to a chisel edge with one side of greater diameter than the other, or the edge will assume a rounded, irregular shape. When this occurs, it is impossible to make a straight or clean cut, excessive power

Fig. 6—Slabs or plates can be cut on this horizontal type of abrasive cutting machine. The wheel cuts on both the forward and return strokes

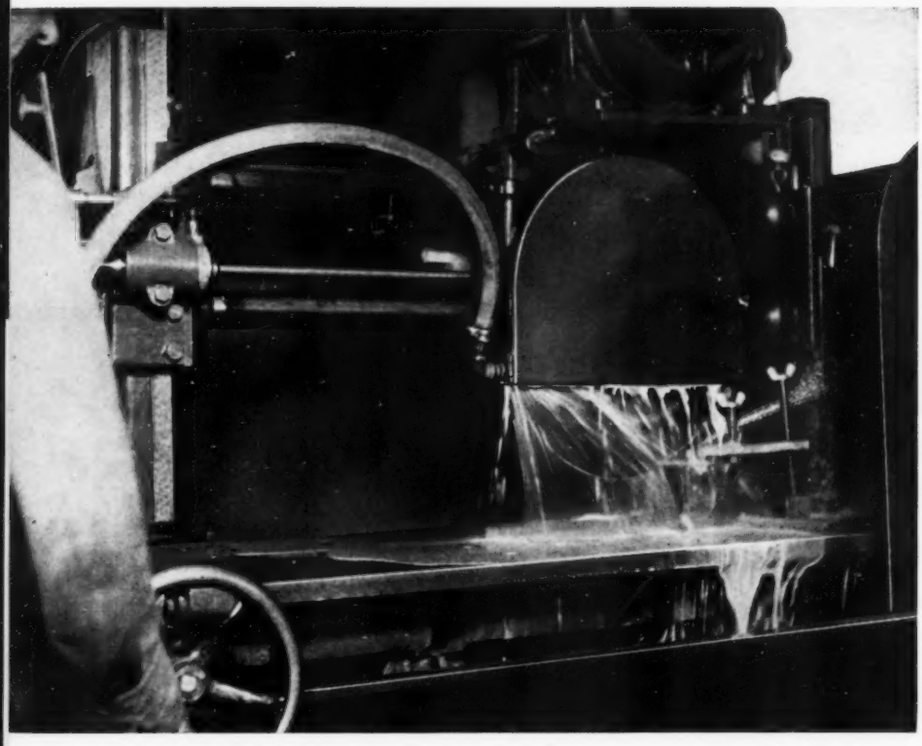


Fig. 7—In cutting thick slabs on the horizontal type machine a light scoring cut is first made to guide the wheel, which is then lowered after each stroke until the work is cut through

is required to drive the wheel, and as this condition becomes accentuated, wheel breakage results.

As the coolant contains abrasive wheel and bonding material particles, it is impossible to maintain an absolutely uniform flow of coolant through nozzles or comparatively small openings. The solution to this problem is to pump the coolant into the coolant box, allow the abrasive wheel to pick up a supply of coolant and then remove the excess by passing the wheel through adjustable coolant box wings (Fig. 5) which scrape off the excess coolant. The wings are adjusted to within a few thousandths of the sides of the wheel. By use of this device, an abrasive wheel retains its proper shape on the periphery until it is worn out and discarded.

The advantages of abrasive cutting have been applied to slabs or plates of steel, glass and other material by the development of a type of machine (Fig. 6) which is designed to feed the wheel horizontally across the work, any given number of passes, and to feed the wheel downwardly at the end of each pass or stroke. Cutting can be accomplished on both the forward and return strokes. This type of machine permits close adherence to the fundamental principle of abrasive cutting: proper regulation of the area of material in contact with the wheel to obtain maximum cutting efficiency.

Fig. 7 shows an operation in process on the horizontal type of machine. In cutting a glass slab on this wet type of machine, the work is first clamped securely to a table. A rubber bonded abrasive wheel is used and is lowered to make a cut about $\frac{1}{16}$ in. deep across the entire piece of material. This comparatively light cut is made without undue stress being placed either on the wheel or the machine, and the groove is consequently straight. At the end of this preliminary scoring cut, the wheel is lowered from $\frac{1}{16}$ in. to $\frac{5}{32}$ in. at the end of each stroke, the wheel being guided by the original scoring cut and the successive cuts. This procedure is repeated until the work has been completely cut. At the end of the operation there is no indication that a series of cuts has been taken, the surfaces of the work appearing as though they had been made with one pass of an abrasive wheel. The cutting of other materials is accomplished in the same manner. When steel is being cut, aluminous oxide wheels are used in place of the silicon carbide type used on glass and similar materials.

Limit of Capacity

On simple bar type machines, the limit of capacity is about 2 in. diameter on solid steel and 3½ in. diameter on tubing. The limiting factor of this type of machine relates to a fundamental condition that apparently applies only to abrasive cutting. When an abrasive wheel is fed directly into a bar of steel, the wheel will only clear itself when in contact up to a maximum amount of about 20 in. Even before this point is reached, the chips and discarded grit tend to roll between the wheel and the work preventing the wheel from making a full contact with the work. The result of this condition is that the chips and discarded grit wear the wheel away instead of the material that the wheel is supposed to

cut, preventing each grit from doing its proper share of cutting. This condition held back the application of abrasive cutting on the larger sizes of material.

Machines have now been developed which overcome this condition by a combination of down feed and oscillating motion which reduces the amount of contact when cutting large material to the sufficient point of cutting that is obtained by the smaller types of machines when cutting comparatively small material. The oscillating type machine also reduces the pressure required to feed the wheel.

Generally speaking, an abrasive wheel requires about 35 lb. feeding pressure when cutting off 1-in. diameter steel. It requires only about 12 lb. when cutting ½-in. diameter and increases to 80 lb. when cutting 2-in. diameter. Without the oscillating motion to the wheel, approximately 225 sq. in. of steel can be cut off with a 16-in. diameter wheel when cutting ½-in. diameter steel. Only about 150 sq. in. can be cut off when cutting 2-in. diameter material, indicating a tremendous increase in cutting wheel efficiency if that portion of the wheel in contact with the work can be held to a comparatively small section.

Oscillation Speeds Cut

The regulating of wheel contact by a combination of wheel feed and oscillating motion led to a startling example of benefits gained when cutting larger sizes of material. Cutting 2-in. diameter steel on this type of machine, as ordinarily set up, would require a feed pressure of 35 lb. With the oscillating motion (Fig. 8) the cut-off time would be 50 sec. With no change made in the feed pressure, but operating the machine without the oscillator, the time of cut is 11 min.

Due to the lighter feed pressure possible and small wheel contact, a great increase in wheel efficiency is made on the oscillating machine. On 2-in. diameter steel, approximately 50 cuts can be made without oscillation with a 16-in. diameter wheel, while with the oscillator, about 105 cuts can be made with the same size wheel. The time per cut with the oscillator, of course, is at the 50-sec. rate. Machines of the oscillating type are now being used in production for cutting solid steel bars up to 6-in. diameter, the bars being either hardened or soft steel. Fig. 9 shows the surface finish obtained in cutting a 6-in. steel bar on an oscillating type machine.

Abrasive cutting has now advanced to the stage where it can be adapted to difficult cutting operations involving special work-holding fixtures. In the case illustrated in Fig. 10 an oscillating type machine is used for cutting 4-in. diameter test specimens for crankshaft forgings.

This is the second of a series of three articles on abrasive cutting. The third will appear in an early issue. The machines described in this article are patented.

Fig. 8—The nature of the oscillating movement of the abrasive wheel is shown by this drawing. The wheel is represented in center and limit positions

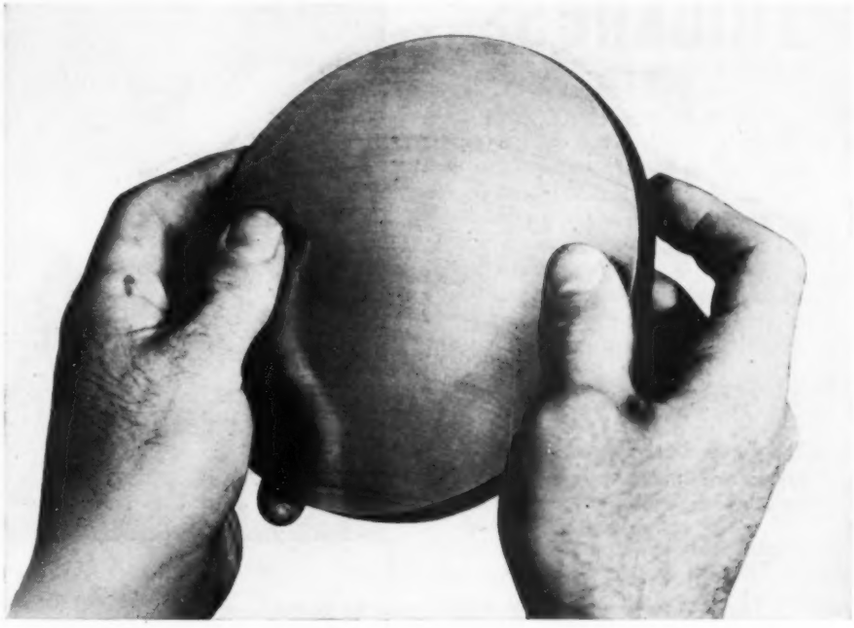


Fig. 9—A section cut from a 6-in. bar on an oscillating type machine, illustrating the smooth finish obtained

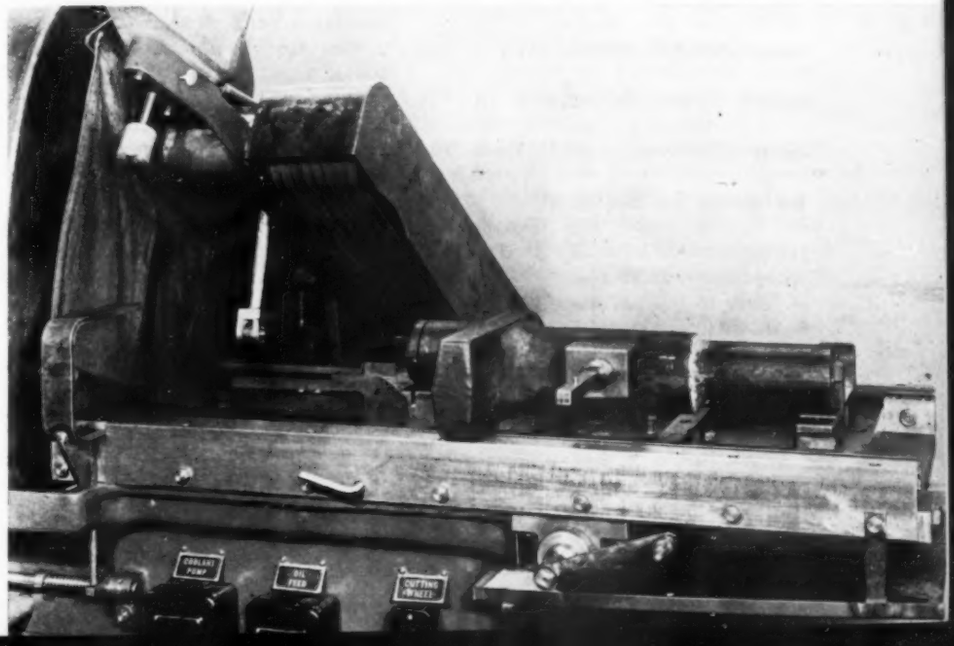
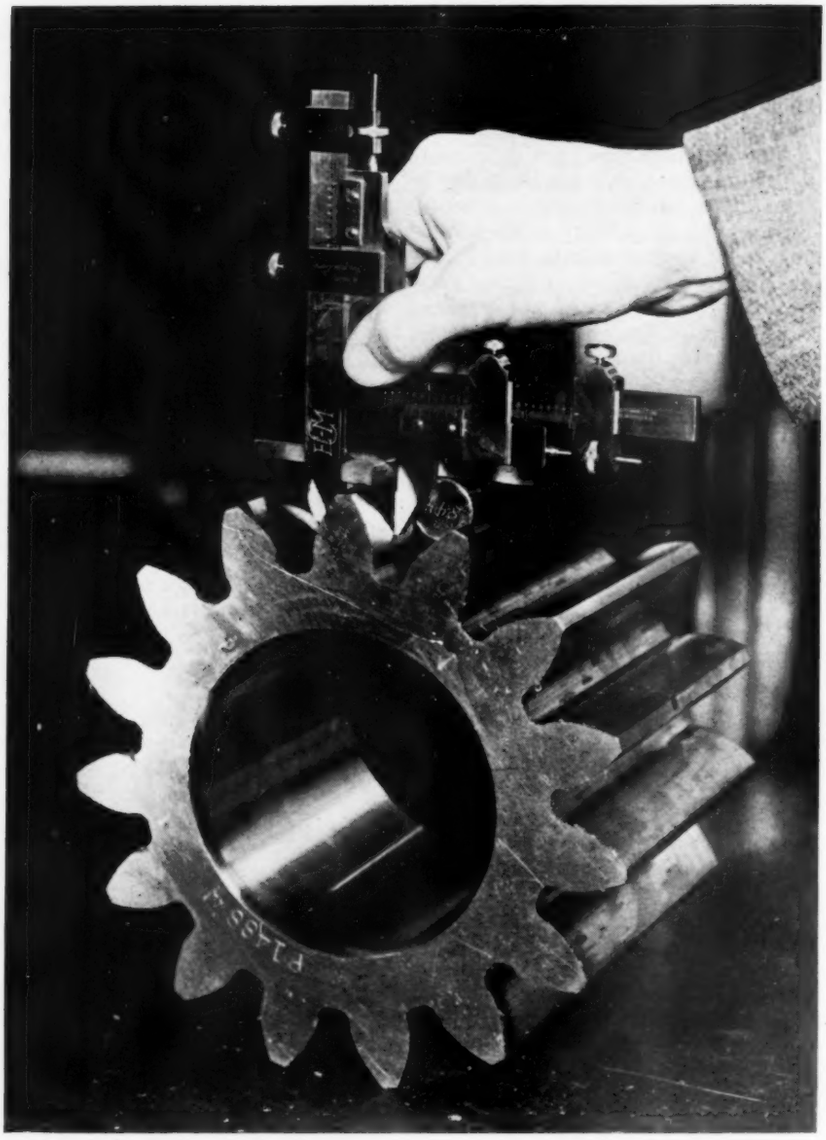


Fig. 10—This oscillating type machine equipped with a special workholding fixture is used for cutting test specimens from a crankshaft forging

Measuring Gear Tooth Thickness



The tooth thickness of gears can be accurately measured by using two rolls, a T-bar, and conventional gear tooth calipers as illustrated

BY CLYDE A. YOUNG, ELECTRO-MOTIVE CORPORATION

This simple method of gear tooth measurement avoids errors that result from variations in the gear diameter; calculations can be made in the drafting room

MEASURING the tooth thickness of gears with conventional gear tooth calipers is likely to be inaccurate for two reasons. First, the outside diameter of the gear is often inaccurate, this error being permissible since generous clearances to the root of the mating gear is ordinarily provided. Many shops do not remachine the outside diameter after heat treating. Variations affecting this diameter are liberal diameter tolerance, out-of-round and eccentricity with bore or center. The second error affecting the caliper is the fact that it rests on a circular arc instead of on a flat surface, so that it may be rocked and the reading affected.

Diameter tolerance and out-of-round may be compensated for by measuring the actual diameter with micrometers and making a corresponding correction of the chordal addendum. In the case of an odd number of teeth this has complications and requires computation in the shop since the draftsman cannot predetermine these measurements. Eccentricity may be measured from bore to outside except for blank centers, very small bores, or projecting or inset hubs, in which cases it is difficult or impossible. All of such correction measurements should be made at each tooth to be calipered.

The "rocking" of the caliper, so that it is not tangent to the outside circle when measuring cannot be compensated for.

The following method permits much more accurate measurements predetermined in the drafting room. No complicated tools other than the ordinary gear tooth caliper are required and the outside diameter with its variations does not enter the procedure.

Two rolls, which may be commercial drill rod or dowels, are used in the tooth spaces adjacent to the tooth to be measured. On these rolls is laid a T-bar made by grinding parallel faces on a T-shaped steel bar. The gear caliper rests on the top face of the outstanding leg of this bar. For convenience in figuring this bar should be some nominal thickness, say 0.250 in.

Since the point of intersection of the pitch circle and the involute is the key point of tooth action, the rolls should be of such diameter that the point of tangency with the involute is as close as possible to this key point. At the same time it is desirable to adhere to standard drill rod or doweling diameters so that special rolls are unnecessary, although stock could be ground to come tangent at the pitch line if desired due to modifications of the involute above the pitch line. Buckingham's "Manual of Gear Design" recommends a roll diameter of $\frac{1.68}{D.P.}$ or slightly larger. Commercial drill rod has a tolerance of plus or minus 0.0005, while precision ground dowels may be obtained plus or minus 0.0001.

To find the corrected addendum from the top of the T-bar (Fig. 1):

$$Inv\ \phi_2 = \frac{T_1}{2r_1} + Inv\ \phi_1 + \frac{x}{r_1 \cos \phi_1} - \frac{\pi}{N} \qquad (1)$$

where ϕ_2 = Pressure angle at center of roll = angle BAC = angle COB

T_1 = Circular tooth thickness at pitch line = Arc DE

r_1 = Pitch radius = OD

ϕ_1 = Pressure angle at pitch circle

x = Radius of roll = AF

N = Number of teeth

$$r_2 = \frac{r_1 \cos \phi_1}{\cos \phi_2} \qquad (2)$$

where r_2 = Radius to center of the roll = OA

$$\theta_1 = \frac{180}{N}$$

$$OB = r_2 \cos \theta_1$$

Radius to top of T-bar = $OG = OB + x + T_2$

where $T_2 = FH$ = Thickness of T-bar

$$\theta_2 \text{ (radians)} = \frac{T_1}{2r_1}$$

$$OJ = r_1 \cos \theta_2$$

Corrected Addendum = $JG = OG - OJ$

Then Corrected Addendum =

$$r_2 \cos \frac{180}{N} + x + T_2 - r_1 \cos \frac{T_1}{2r_1} \qquad (3)$$

In the expression $\cos \frac{T_1}{2r_1}$ remember that the ratio $\frac{T_1}{2r_1}$ gives the angle in radians, and that the corresponding degrees are to be found to obtain the cosine.

In using the dimension T_1 (circular tooth thickness) make sure that you use the actual tooth thickness with the backlash subtracted, otherwise the computed corrected addendum will be too long and the measured chordal tooth thickness larger than that actually machined at the pitch line. In other words the measurement will be made below the pitch line, where the tooth is fatter. Formulas 1 and 2 are from Buckingham's "Manual of Gear Design." The Industrial Press.

To find the diameter of a roll which will be tangent to the involute at the pitch line (Fig. 2):

Arc $AB = \frac{C.P. - T_1}{2}$ where $C.P.$ = circular pitch = $\frac{\pi}{D.P.}$

$$\theta_3 \text{ (radians)} = \frac{AB}{r_1} = \frac{C.P. - T_1}{2r_1} \qquad (4)$$

$CD = r_3 \tan (\phi_1 + \theta_3)$ where r_3 = Radius of base circle = $r_1 \cos \phi_1$

$CB = r_1 \sin \phi_1$

$x = CD - CB = r_3 \tan (\phi_1 + \theta_3) - r_1 \sin \phi_1$

$x = r_1 \cos \phi_1 \tan (\phi_1 + \theta_3) - r_1 \sin \phi_1$

Then the diameter of roll which will be tangent to the involute at the pitch line = 2 r_1

$$[\cos \phi_1 \tan (\phi_1 + \theta_3) = \sin \phi_1] \qquad (5)$$

Since the rolls must project above the gear, the minimum roll diameter will be outside diameter $-2\ r_2 +$ clearance; r_2 may be found by formula 2, or if the roll is tangent at the pitch line it is simpled to use $r_2 = \frac{r_3}{\cos (\phi_1 + \theta_3)}$ If the rolls of this diameter will be so large as to be tangent to the involute at some point a relatively large distance from the pitch line, gage blocks may be laid on smaller rolls and the T-bar placed on top of these. In this case add the thickness of the gage blocks to that of the T-bar for computing the corrected addendum.

For large-face gears an H-shaped bar may be used to advantage eliminating any tendency to tip over.

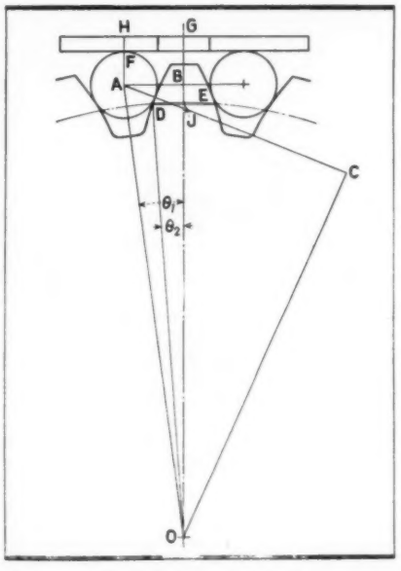


Fig. 1—If the diameter of the rolls to be used is known the calculation of the corrected addendum GJ can be made in the drafting room

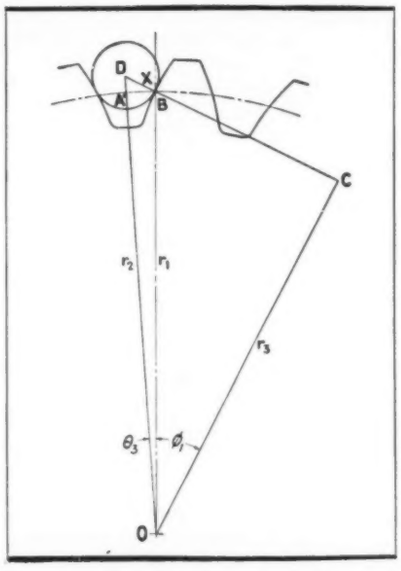


Fig. 2—If desired a calculation can be made to find the diameter of a roll which will be tangent to the involute at the pitch line

Old Men Get a Break

BY G. E. MOORHOUSE

Machinists and others in middle life who have been sitting around their homes, some for several years, because employers have put a ceiling on age of about 40 to 45 years are now hard at work again in industry. The return of these technical men to industry, due to war needs, has been positive proof that they are still able to do a good day's work.

Some men of 60 or more are reported to be going to work daily in the industries of the middle west and are keeping up with the pace set by the younger men. Some employers state that middle aged men are often better trained and more efficient than many of the younger men.

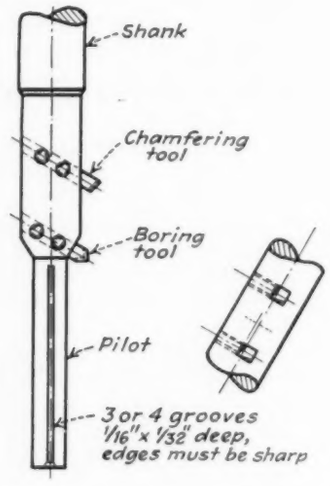
Employment bureaus specializing in technical men are running long advertisements in the daily classified columns seeking skilled workers of all ages. The hoax about a man past 40 being too old for modern industry has been exposed.

Boring Bars, Pilots, Special Tools

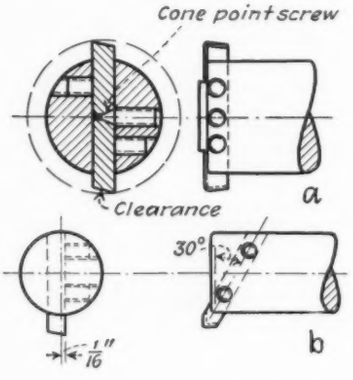
BY JOHN G. JERGENS, CLEVELAND PNEUMATIC TOOL COMPANY

A VARIED GROUP of tools and holders is included in the drawings on these pages. Boring bars intended to meet more or less general requirements, as well as designs to meet special needs or provide precision adjustment, are shown. The construction of different types of revolving pilot bushings is featured in several of the drawings.

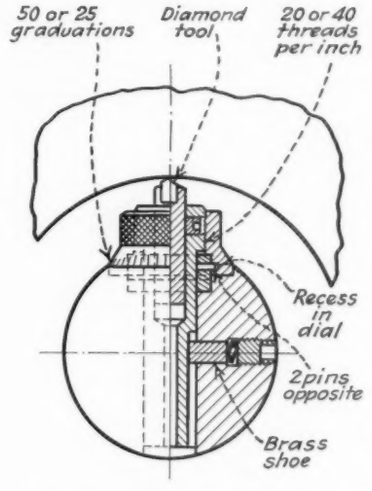
Three types of floating tool holders are included, one of which uses a square key while the other two use combinations of pins to transfer the driving power. A variety of individual designs include a special tap holder, a pipe tap equipped with a chamfering tool, and a recessing tool. Somewhat unusual are the trepanning tool and the ball-forming tool. The former cuts an annular hole, that is, a hole which is shaped like a ring.



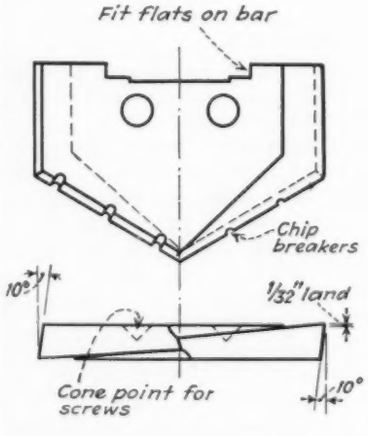
Set screws hold both a boring tool and a chamfering tool in this bar. Oil grooves are cut in the pilot



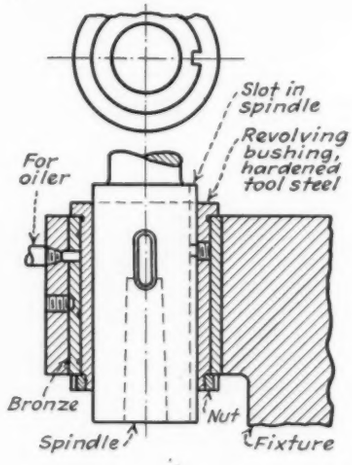
A cone point screw in the center of boring bar (a) provides uniform adjustment of the cutting bits. The simple form of boring bar (b) is standard for many operations



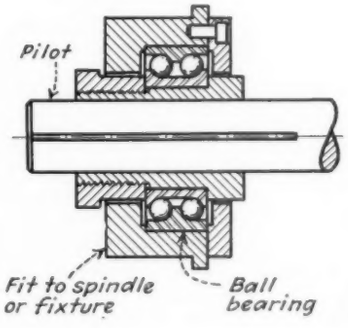
With this precision adjustment, settings which are accurate to 0.001 in. can be easily made



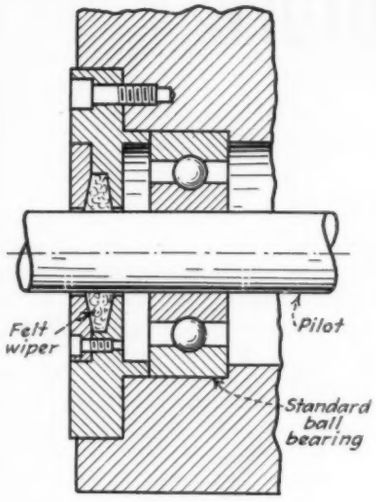
This drill blade fits into a slot in the end of a boring bar and is held in place by screws which fit into the cone points in the blade



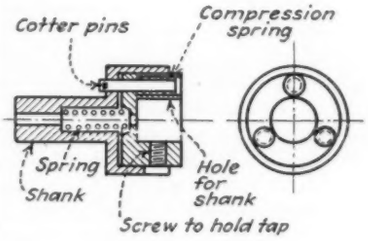
This revolving bushing has a set screw fitting into a key in the spindle to avoid slippage. The bushing is slipped into the bronze bearing and held by a nut which attaches to the bushing



This revolving pilot is equipped with ball bearings. Oil grooves in the pilot bar lubricate the bushing through which the pilot slides

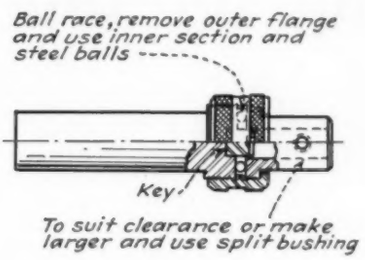


Another form of ball bearing bushing for a revolving pilot. Felt wipers are used to lubricate the pilot bar as it slides through the bushing

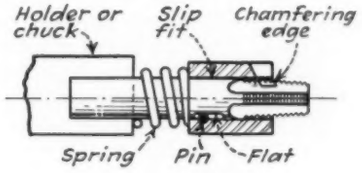


Four compression springs are mounted in this tap holder to act as a cushion against shock. A set screw holds the tap shank in place

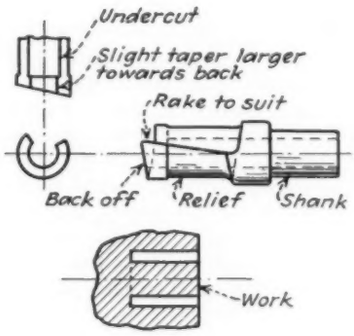
This trepanning tool is used for cutting an annular groove in the work

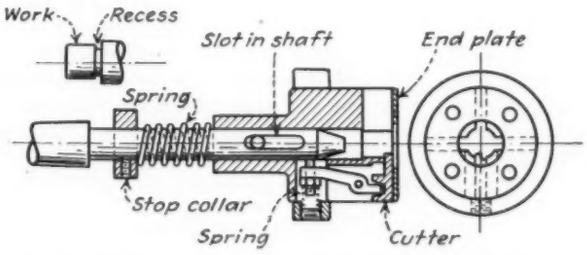

Ball race, remove outer flange and use inner section and steel balls
Key
To suit clearance or make larger and use split bushing

This floating tool holder uses a square key to transmit the power from the shank to the reamer

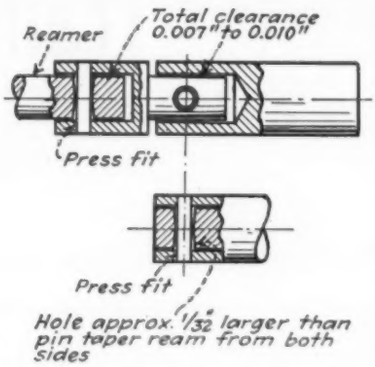


This pipe tap has a chamfering cutter slipped over the tap against a compression spring and held by a pin

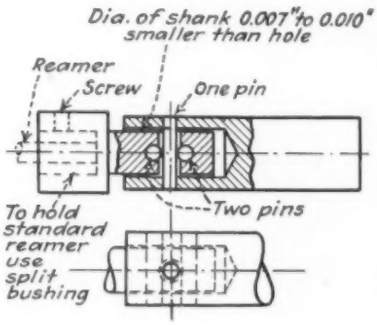




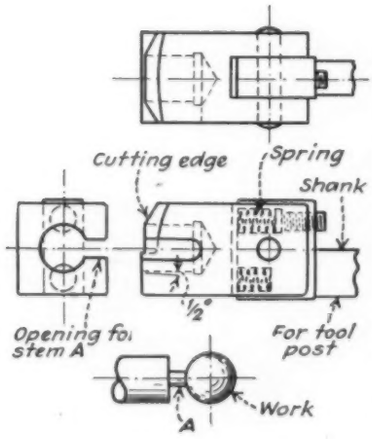
The body of this recessing tool strikes a shoulder on the work and as the shaft advances the recessing tool is brought into action. Shown in closed position



Another form of floating tool holder uses two pins at right angles



Three pins are used in this floating tool holder. A split bushing is used to hold standard reamers

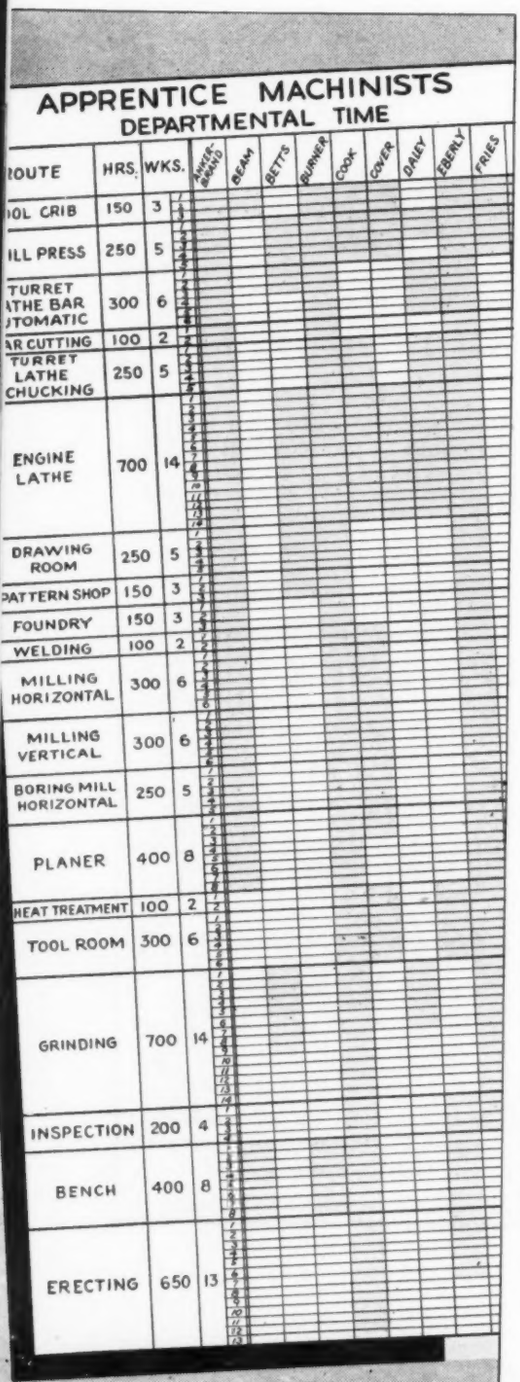


This tool will form a ball mounted on a stem. The ball is formed from a revolving cylindrical blank

Training for the Future

BY FRED A. FIRNHABER, APPRENTICE SUPERVISOR, LANDIS TOOL COMPANY

Many hours of practical shop experience are combined with supervised classroom studies in this program for training much needed shop journeymen



A continuous record is kept of each apprentice's shop assignments. This chart records the time spent in each department by apprentice machinists. It was made up for the present 50-hr. week program

APPRENTICE TRAINING programs are usually designed to produce self-reliant and progressive journeymen, capable of doing any class of work on any type of machine. In operating its apprentice training groups, the Landis Tool Company goes a step further in that it expects to develop future supervisors.

Since 1937, when the present plan of apprenticeship training was adopted, more than 10 percent of the boys who have completed the courses now hold positions of responsibility and authority. Others are roving inspectors. Some have been given intensive training in design, construction and assembly of machines, and are now service men assigned to various sales offices. Several have gone on to take a special course in drafting, and have taken their places in the engineering department.

Applicants for apprentice training are carefully investigated. Each of the boys must have passed his eighteenth birthday and be of good moral character. The classes are composed in the main of high-school graduates who have no opportunity for further schooling. Boys with one or two years of college training are also admitted. Wherever possible, sons of employees are given preference; in some instances three generations are in the employ of the company.

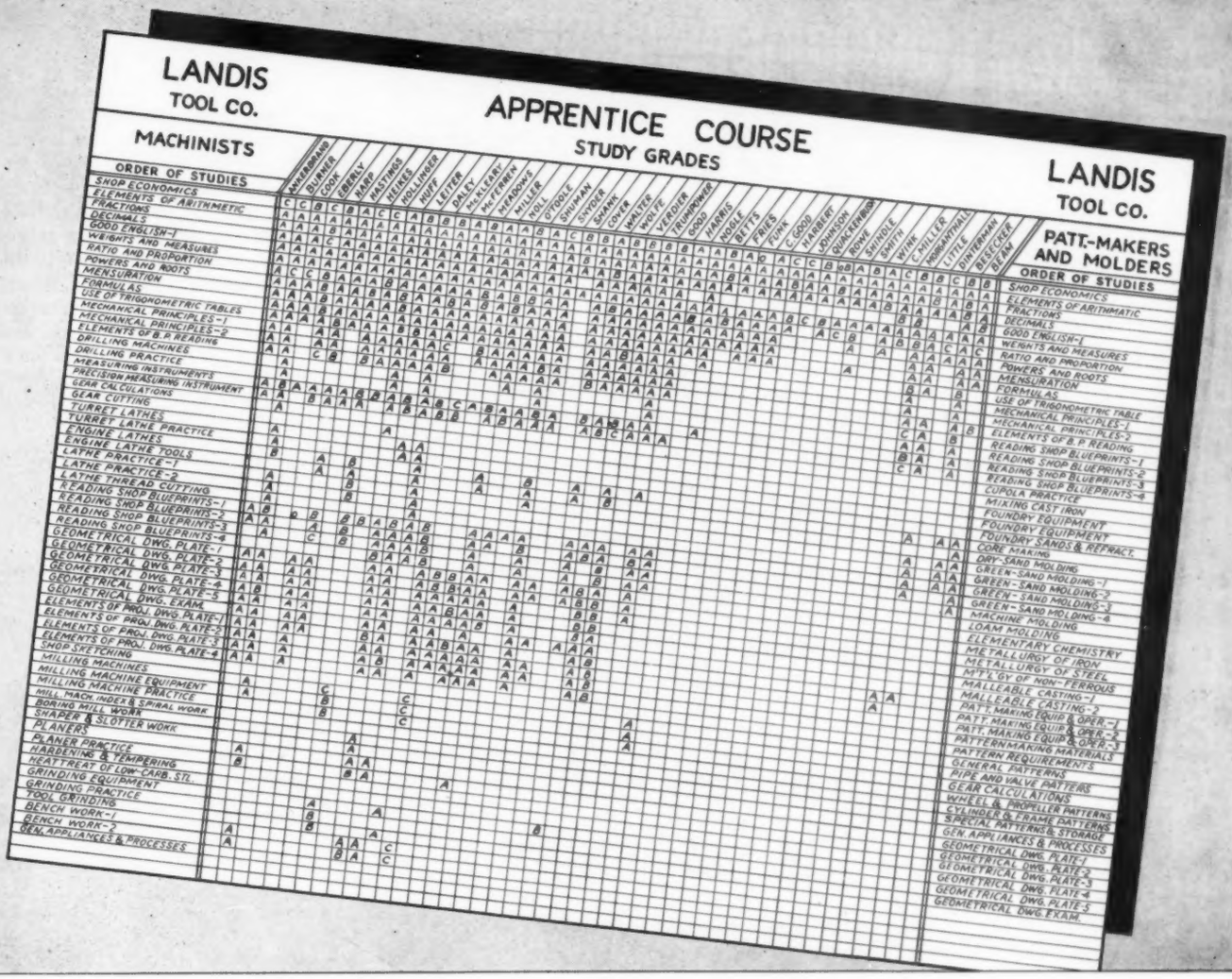
During each of the several apprenticeship courses, the boys spend all of their time in the main production shops, rather than in a separate department set aside for training purposes. In addition to his shop assignments each boy is required to attend instruction classes where he studies academic courses paralleling his shop work.

In order to allow a large class to be trained at one time without causing too much bookkeeping on the part of the company, it was decided to select courses providing books, lessons, questions, examinations and grading offered by the International Correspondence Schools. All prepared lesson papers are mailed to this school where they are examined, graded, and returned to the student through his apprentice training supervisor. The company pays for these courses, supplies all necessary materials and assumes mailing expenses. It has also made available a large, clean, well lighted and well ventilated room, devoted exclusively to class work. A large blackboard mounted on one wall is used during instruction periods and general class discussions.

The first four months of apprenticeship constitute a probationary period during which time the boy and the management can ascertain his adaptability in the trade for which he is apprenticed. During these four months, the machinist apprentice is assigned to the tool crib, drilling and turret lathe departments. At the end of the probationary period, the apprentice signs his contract and is enrolled in the classes of associated academic work. He is credited with these four months as having completed the time allotted in the first three departments, and he continues to be moved from department to department as a regular apprentice.

When the machinist apprentice enters the pattern shop and foundry, his stay of six weeks is divided so as to embrace all the departments into which the molding apprentices go. Conversely, the pattern and molding apprentices spend six weeks in the machine shop, during which time three weeks are spent laying out castings for finish allowances, and three weeks on the erecting floor, fitting together the various castings that go to make up a machine.

Toward the end of the 6,000-hr. machinist training course, each apprentice goes to the drawing room for five weeks. Here the boys who have an aptitude for mechanical drawing are given an opportunity to spend an additional 4,500 hr. on a special drafting course. At the end of that time they have set a total of 10,500 hr. in training, and they are given two certificates, one as a graduate machinist apprentice, and the other for the drafting course. The time of these drafting students is allotted to the several engineering departments, and the graduate machinist-draftsmen are ready to take their place beside col-



Each apprentice's grades are charted for all classroom assignments. I.C.S. lessons are used, lesson papers being mailed to the school for grading. All expenses involved in these courses are paid for by the company

lege-trained draftsmen in the company.

Because there usually is a waiting list of boys eager to learn a trade, it is expected of every apprentice that he should pay attention to his work, follow instructions, and obey shop rules. During the early stages of his apprenticeship, quality of work suffers in some instances. But a number of boys who have graduated from the industrial arts course of the local high school, and some who have had experience with home workshop machine tools, are found to turn out work of high accuracy. Although all of the apprentices work under a bonus system, rapidity of production as far as the individual apprentice is concerned is not stressed. That will come as he gains experience.

Each month the foremen grade each apprentice in their department, using forms furnished by the apprentice training supervisor. The grades from these rating slips are tabulated on individual pages of a loose-leaf record book from which it is easy to determine whether an apprentice's progress is satisfactory. Each month the average of the eight grades given by his foreman is added to the individual apprentice's rating curve, which shows whether his grades have advanced or retarded, and the graphs showing each apprentice's progress are clipped together and posted on a bulletin board in the class room. This gives each boy an opportunity to compare his progress with that of his fellow students. Experience has shown that the competitive spirit so developed results in accelerated advancement. A major advantage of keeping these records is that the young man's capabilities can be judged fairly when an opportunity for advancement may arise.

One of the first class lessons given a group of new apprentices, is a brief discussion of our economic system as it applies to industrial work. The speaker usually is the vice-president of the company, and he also gives the boys an intimate account of the company's history, aims, and departmental set-up. An organization chart is drawn on the blackboard to show the various offices, and the duties of each as they are related to the other departments within the plant. The first few lessons after the industrial economics lecture are devoted to a general brushing-up in arithmetic, fractions, decimals, weights and measures, ratio and proportion, powers and roots, mensuration, the use of formulas, and trigonometric tables. Any weakness in simple mathematics is brought out during the time spent on these subjects, so that individual attention can be directed toward that subject.

Mechanical principles are then studied. This is another review covering the physics course in high school. Since these classes are composed, for the most part, of high school graduates, some of whom have finished school one or more years prior to starting the apprenticeship, it has been found beneficial to retrace all phases of general mathematics and physics so as to make certain that the boys are well grounded.

In so far as possible, classroom work is arranged to parallel shop work. While in the drilling department, after three weeks in the tool crib, the boy is ready for books dealing with drilling, reaming and tapping operations. He also has several classes in the use of measuring instruments. Books on blue-

Each apprentice is graded by his foreman on eight characteristics once a month. Average grades are charted for posting on the classroom bulletin board. Friendly rivalry helps maintain a high level of accomplishment

print reading also are studied in advance of the time spent in the drawing room and the more important departments of the shop. During the course on shop sketching he becomes familiar with the making of isometric drawings, so that he will be able to make sketches which can be understood by shop men.

While the machinist apprentice is in the lathe department, he is required to study seven books which deal with turret lathes, types of turning tools, threading dies and taps, set-ups and operations. The theory of cutting tools is covered thoroughly, and information is included on turning, boring, cutting off, forming, thread cutting, and calculations for change gears for speeds and feeds.

When he enters the milling department, the various types of machines, and cutters, as well as the theory of cutting, are covered by his books. Direct, compound and differential indexing are covered in such a manner as to cause the apprentice to make numerous calculations that will be helpful to him later. In the planer department he spends the first four weeks with an experienced man who teaches him the rudiments of planer practice. He then is put on his own doing production work on medium and large planers in another department. In his related academic work he learns the principal parts of a planer, and the operation of these machines. Adjustments, lubrication, maintenance, equipment and tools are discussed at length. The same practice is followed while he works on shapers, slotters and boring mills. In the heat-treating department the apprentice learns to harden and temper tools, and machine details made of high carbon steel. He packs work into case carburizing pots where that type of heat-treatment is required. He also pours babbitt bearings.

The course has been so arranged that the numerous phases of grinding are taught intensively and thoroughly. Operation of plain cylindrical, universal, internal and other grinding machines make up the boy's work in this department. Meanwhile, his lessons deal primarily with the art of grinding. Starting with a study of abrasive materials, he advances through the various stages of grinding, wheel construction, grain, grade and shape requirements. Wheel mountings are discussed, and the apprentice studies the mechanisms and functions that go into plain and automatic machines. The practice of lapping and polishing also are taken up in the course.

In addition to the above training and grinding, evening tours of the shop are arranged periodically to acquaint the boys with special forms of grinding (camshaft, radial cam, crank and roll grinding). These are separate departments through which the apprentice is not routed during his course. Usually, the working force is on duty during these visits, solely to make the visit as realistic as possible. The boys are divided into groups and experienced workmen instruct the boys in the rudiments of precision grinding. Here they see how super-precision instruments are used, and study the assembly of 50,000 r.p.m. spindles in a dust- and moisture-proof room held at a constant temperature.

Gear cutting and thread milling are enlarged upon with problems in the classroom, emphasis being placed on gear train calculations. Next, the boy is routed to the drafting room which is equipped with modern drafting machines. The first five drawings that he makes deal with line work, dimensions and geometric shapes. Then he progresses to simple projections. The rest of the time in the drawing room is spent in making actual shop drawings, involving simple shop mathematics for some dimensions. Machinist apprentices usually are given work on steel spindles and shafts, cast iron slides, gears, pulleys and various housings. Some boys who acquire technique rapidly, get to make assembly drawings of machine mechanism from details, building up piece by piece as the drawing is developed.

As a rule, the machinist apprentice goes into the pattern shop after leaving the drafting room, and later is assigned to the foundry. First, he makes a pattern of the plain webbed pulley that he designed in the drawing room. This requires lathe turning and hand chisel work. His first casting job in the foundry is to cast this pulley. Entering all departments in the foundry, he gets a good idea of the operation of that department. He learns how cast iron is made, because he wheels and dumps all ingredients into the top of the cupola.

Armament

SECTION OF AMERICAN MACHINIST

ALUMINUM CAN BE DEEP DRAWN

BY CHARLES C. MISFELDT

Aircraft parts formerly made on the drop hammer are deep drawn in one operation on short-stroke punch presses with a single punch and die. All gages of aluminum can be used

ONE of America's foremost airplane builders is using an attachment on a crank press of 2-in. stroke to draw aluminum parts 16 in. deep in a single progressive automatic operation. Not only will a press with this attachment, which was developed by the author, do work that cannot be done by any present method, but it does conventional deep-drawing work much faster than other means. As an example, one airplane part is being produced regularly at the rate of one piece every two minutes on this press, whereas the best drop-hammer time for the same part is one hour, plus an additional hour for speed hammer and hand finishing work.

The development is important because the punch press, although used widely in the automobile industry for deep drawing special steel alloys and in the aircraft industry for blanking, stamping and shallow drawing of aluminum alloys, it is not suitable for deep drawing non-ferrous aircraft materials. Aluminum alloys work harden easily and will not flow if drawn

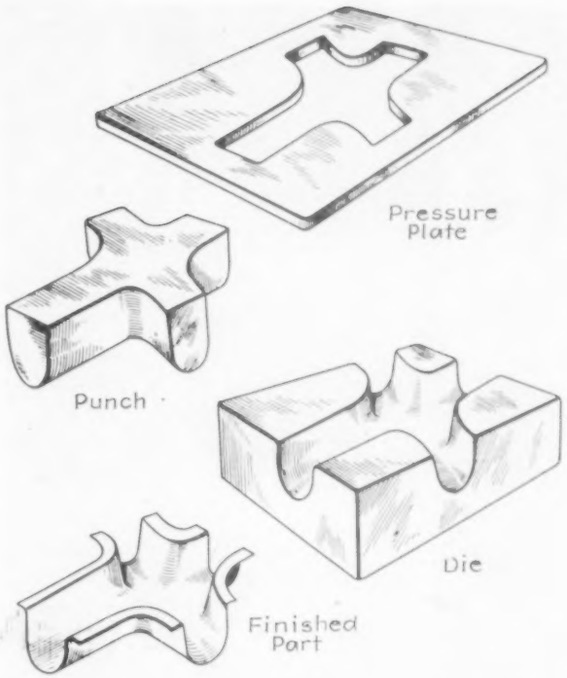
The bed of this Bliss 2-in. stroke punch press is elevated a small amount during each up stroke of the ram. On the down stroke, the bed remains stationary and a pressure pad grips the aluminum sheet so the punch can continue drawing the part. Light-gage aluminum parts can be drawn to depths of 16 in. in a single progressive operation. Arrangement of bolster and pressure-pad cylinders are shown on the opposite page

This article has been reviewed and approved by the proper military authorities

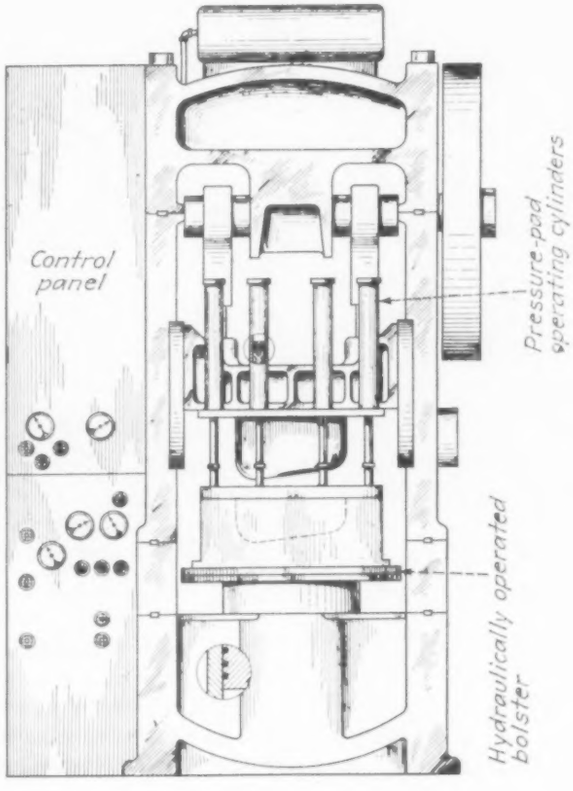
too far past their yield point during forming operations. If further drawing is attempted without annealing, they will fracture. The Misfeldt attachment, by drawing the aluminum alloy in progressive stages and never stretching it far beyond its yield point, makes possible the deep drawing of such alloys. In addition, deep-drawn parts of light-gage aluminum alloys, not heretofore incorporated in airplane design, can now be developed.

The attachment is being used in regular production work on a Bliss 5½–48 punch press. It has a hydraulically operated and controlled moveable bed which elevates the die against the punch, and a hydraulic-pneumatic self-adjusting pressure-pad cushion which maintains a constant pressure on the blank throughout the progressive stages of die elevation. The operation of this equipment is automatic, requiring only the placing of a blank on the die, setting the press in motion, and removing the completed work when the pressing operation is finished.

Each time the punch starts on its down stroke the elevating motion of the die is stopped. During the downward stroke of the punch the material is worked or drawn to a point just past the yield stress of the metal. When the punch starts upward again the die is elevated to its new position to await the next stroke of the punch. This cycle is repeated until the punch has drawn the metal to the full depth of the die and



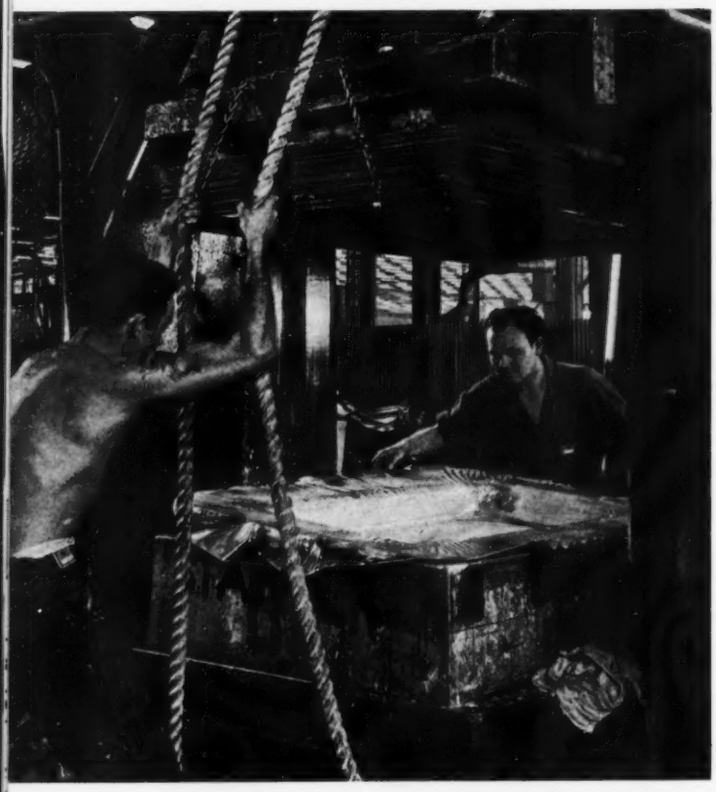
This airplane part is made in a few minutes from light-gage aluminum in a punch press fitted with the Misfeldt attachment, using a single punch and die. Drawing is done in progressive stages during one operating cycle of the press. The aluminum does not work harden because stress limits are not exceeded



has simultaneously upset the material or formed any beads or embossing called for in the design. The entire operation is so cushioned and synchronized that the metal is never excessively strain hardened so as to cause annealing or thinning. Much lighter gages of material can be formed by this process, due to its progressive nature, than can be formed on other presses or the drop hammer.

A vital factor of the Misfeldt drawing process is the action of the pressure pad which is coupled with the motion of the ram to which the punch is attached. At all times throughout the progressive elevating of the die the pressure pad holds a constant uniform pressure on the blank being worked, permitting it to flow uniformly around the punch and into the die without the formation of wrinkles or over stressing of the material.

The thickness of the metal and the shape of the part determines how fast the draw can be made. This depth is adjustable by means of a master valve and can be determined in advance by means of experimentation and set for any production job. The draw is variable from $\frac{1}{8}$ in. to 1 in. per stroke. The press now in use turns 32 strokes per minute, but this speed will vary with the make and model of press and has

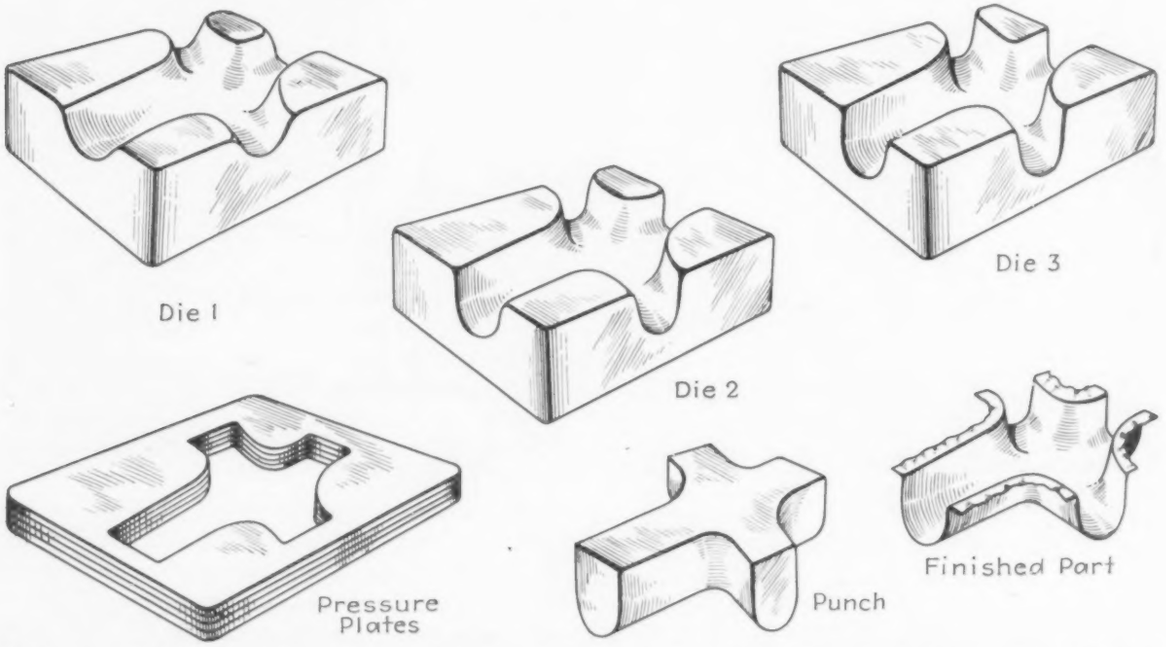


The Misfeldt attachment replaces the conventional drop-hammer method for deep drawing aluminum parts. It eliminates multiple dies and punch shims

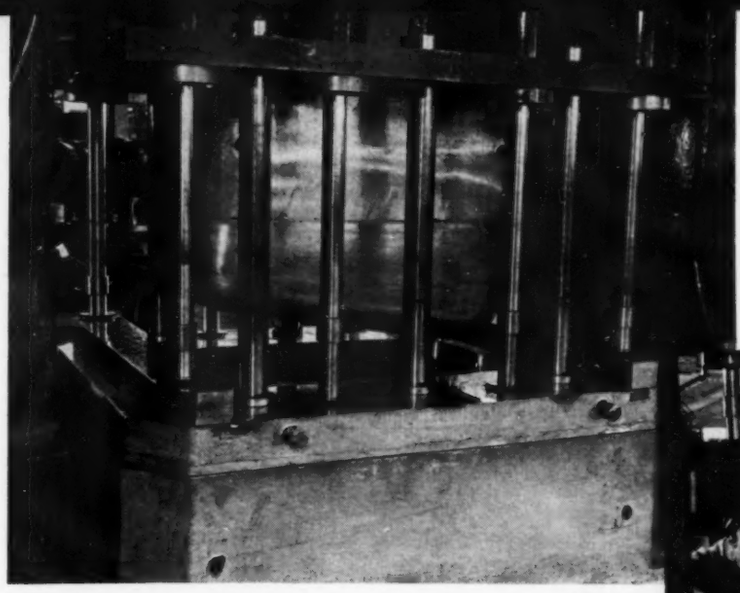
little effect on the progressive drawing operation since the rate of working the material is directly controlled by the speed with which the bed is elevated. This in turn determines the amount of draw performed on each stroke.

The same type of work can be done on a special type of hydraulically operated drop hammer which has been developed for use with the elevating bed attachment. The drop hammer with its various adaptations, such as the use of wood shims, rubber blocks, and blankets, pre-forming, hand forming, and staged dies, has done most of the complex forming operations for the aircraft industry to date. Although a slow and semi-hand operation, it has given the designer and shop man that flexibility of manufacturing method which made it possible to form almost anything that an engineer could conceive, and to do it within reasonable limits of production cost. Consequently, the drop hammer with the Misfeldt attachment should have a wide application to aircraft work, although the punch press adaptation is faster, more efficient, and better adapted to mass production.

The Misfeldt method of progressive deep drawing on the punch press is really a combination of the best features of the drop hammer and the punch press. It accomplishes the production of a wide range of deep-drawn aluminum alloy parts which formerly had to be made on the drop hammer, and it does it at punch press speed.

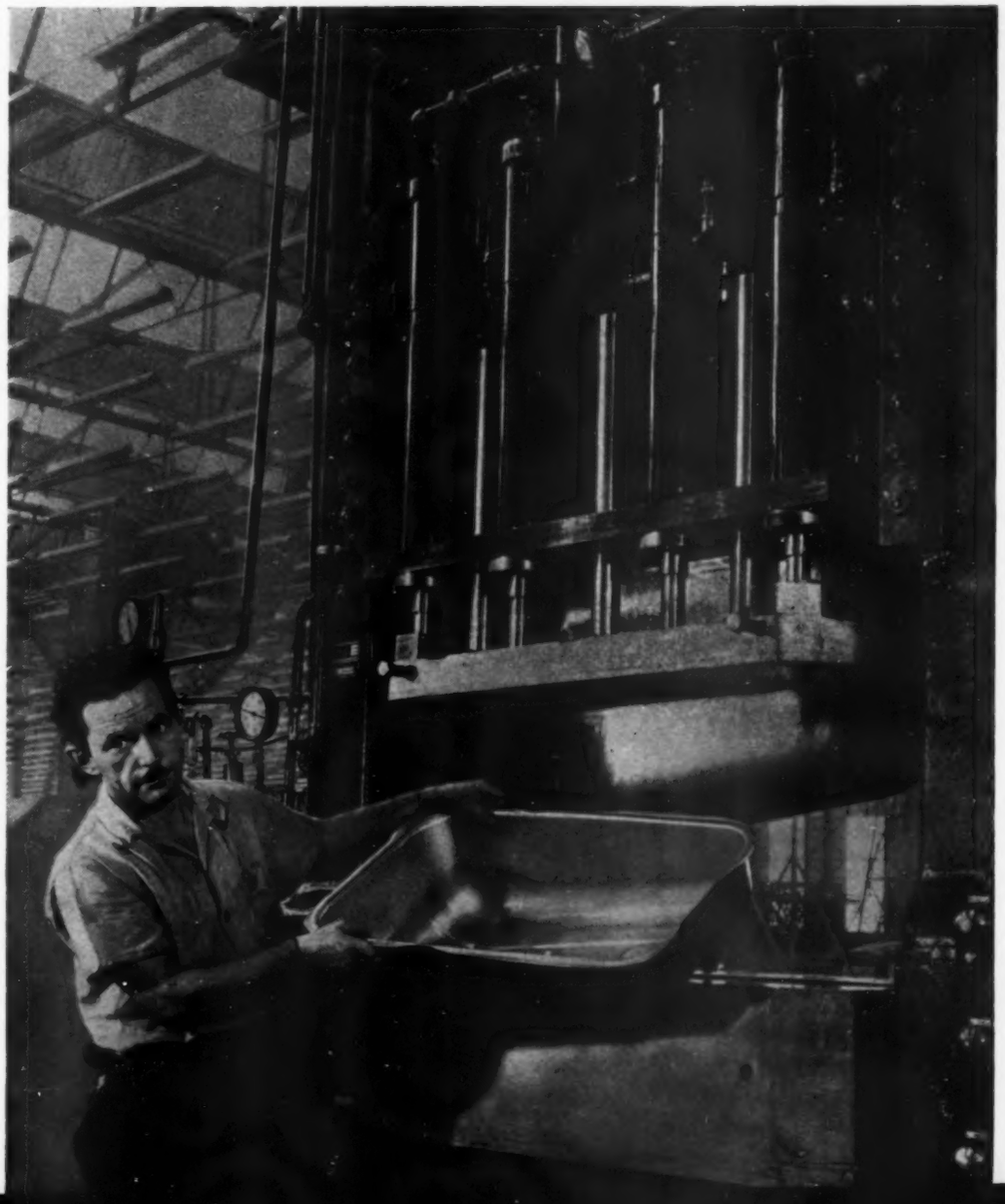


The same airplane part shown in the preceding drawing requires multiple dies and shims around the punch when made on a drop hammer. Production time for drop hammer and hand finishing work on large parts often exceeds one hour. This compares with a few minutes for the press equipped with the Misfeldt attachment



The contoured blank for the oil-tank section is held by a self-adjusting pressure pad that maintains constant pressure on the blank throughout the progressive stages of die elevation

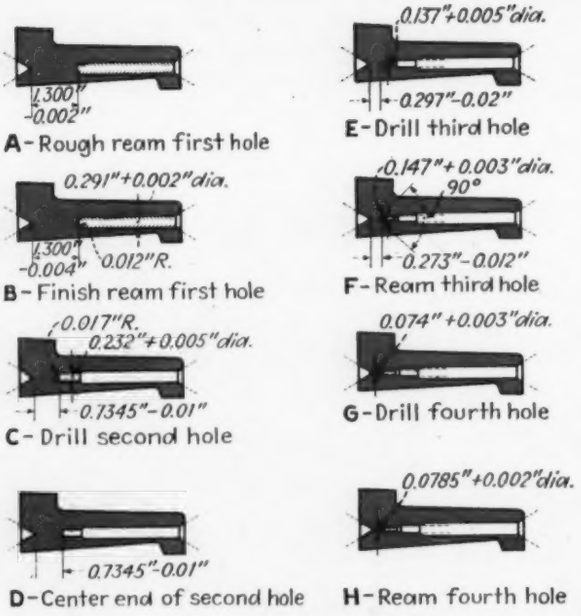
The automatic drawing cycle can be interrupted at any time to inspect the part being drawn. Normally, the operation is continuous from blank insertion to removal of the finished part



This is the first experimental oil-tank section drawn with the Misfeldt attachment. Note the extreme depth of draw and difference in depths at the opposite ends of the tank. When the part went into production, the wrinkles seen on the tank were eliminated

Making the Bren Breech Block

The center holes in each end of the rough breech block are used to locate the piece in practically all of the preliminary machining operations. In the operation shown, two opposite sides are surface-ground so that they are parallel planes and are within 0.0002 to 0.0003 in. of the specified distance on each side of the axis of the piece. The fixture is of heavy construction to maintain accuracy, and has a large jack in the center to support the piece



After a 1/4-in. hole has been drilled in the body of the breech block in a deep-hole drilling machine, it is placed in a fixture on the faceplate of a turret lathe, and the six operations indicated above are performed with hand feed to insure accuracy and fine finish. The fourth hole is drilled approximately 1/8-in. deep before the third hole is reamed, then the drilling of the fourth hole is completed later. High-speed steel drills and reamers are used

MORE THAN 100 operations, including about 80 machining operations, are necessary to produce the breech block for the Bren gun as manufactured in the Canadian plant now in production on this weapon. Many of the machining operations are held within 0.0018 in. and some grinding tolerances are only 0.0006 to 0.0008 in. Gaging allowances on some dimensions are even smaller.

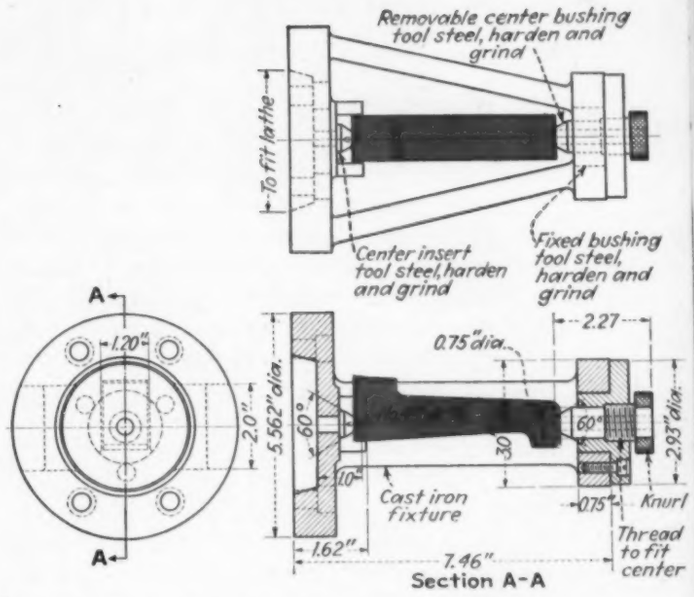
This part is made from a chrome-nickel case-hardening steel forging which weighs more than 2½ lb. when received. In order to facilitate machining operations, the forgings are normalized before delivery to the machine shop. By the time all of the machining operations are completed, this forging is reduced to a weight of little more than ½ lb.

The forging first is milled all over and then surface-ground to square up the surfaces, leaving 0.020 to 0.030 in. on each surface so that they can be resquared by grinding after the center holes at each end have been drilled. These center holes are put in each end of the piece only to locate it during the various machining operations, excess metal removed at each end taking away the center holes before the piece is completed. Depth of each center hole must be held within 0.001 in. in order to locate the part properly in the various fixtures.

After centering and surface grinding operations have been completed on the rough part, it is taken to a deep-hole drilling machine where a hole ¼-in. in

diameter and $2\frac{5}{8}$-in. deep is drilled with a V-bit drill made of carbon steel, so that it will produce a better finish in the hole. This drill has three lands running longitudinally on the outer surface, with 0.002 to 0.003-in. relief between the lands to prevent rubbing of the drill in the hole, and to permit lubrication. The land on the side of the drill carrying the cutting edge is 0.010-in. wide while that at the opposite side of the 90-deg. V-groove is $\frac{1}{16}$-in. wide. The center land is $\frac{3}{32}$-in. wide. Drilling speed is 700 r.p.m., while a low feed of $\frac{3}{16}$-in. per min. is employed to insure a good finish in the hole. The cutting edge on the drill does not have a lip, as a fragmented chip is desired. A sulphurized cutting oil is pumped into the hole during this drilling operation.

Next, the pieces go to a No. 2 Warner & Swasey turret lathe where the girl operator rough and finish reams the larger hole, and drills and reams three smaller holes in the body of the piece. The last hole drilled, only 0.078-in. in diameter, goes through about $\frac{1}{4}$ in. of metal to the bottom of the center hole in the other end of the piece. For this operation the work is held on hollow centers (to permit drills to enter the work) in a pot fixture mounted on the spindle nose of the lathe. High-speed steel drills and reamers with conventional cutting edges are employed for these operations. A drilling speed of 50 to 60 ft. per min. has been found best, while reaming is done at very slow speed to give a fine finish. Hand feed is used for each cut, so the operator can feel the action of the tool and judge whether it is cutting properly. Chips are cleaned out of the hole frequently while drilling or reaming, as the chips from these small



The turret lathe fixture for drilling and reaming the stepped holes in the breech block for the firing pin has a cast iron body with hardened and ground center inserts. It is designed for mounting on the spindle nose of a No. 2 Warner & Swasey turret lathe

Large cone centers in each end of the breech block are rectified with piloted countersinks after the stepped holes in the body have been drilled and reamed. This operation is performed in a sensitive drill press, the piece being supported on a cone directly below the spindle during the cut

The small clearance hole for the firing pin in front end of the breech block is broached with a series of nine high-speed steel cutters in this hand fixture. Each broach is dipped in castor oil before being inserted in the piece. Feed of the broach through the piece is by hand, so that the operator can feel the action of the cutter and so eliminate tears and scoring. The operator in the background is elongating the 0.0786 in. hole in the breech block with a 0.076 in. drill to reduce the load on the roughing broaches

drills do not clear readily. This is a relatively slow operation, each machine producing approximately 7 to 8 pieces per hour with carefully trained operators.

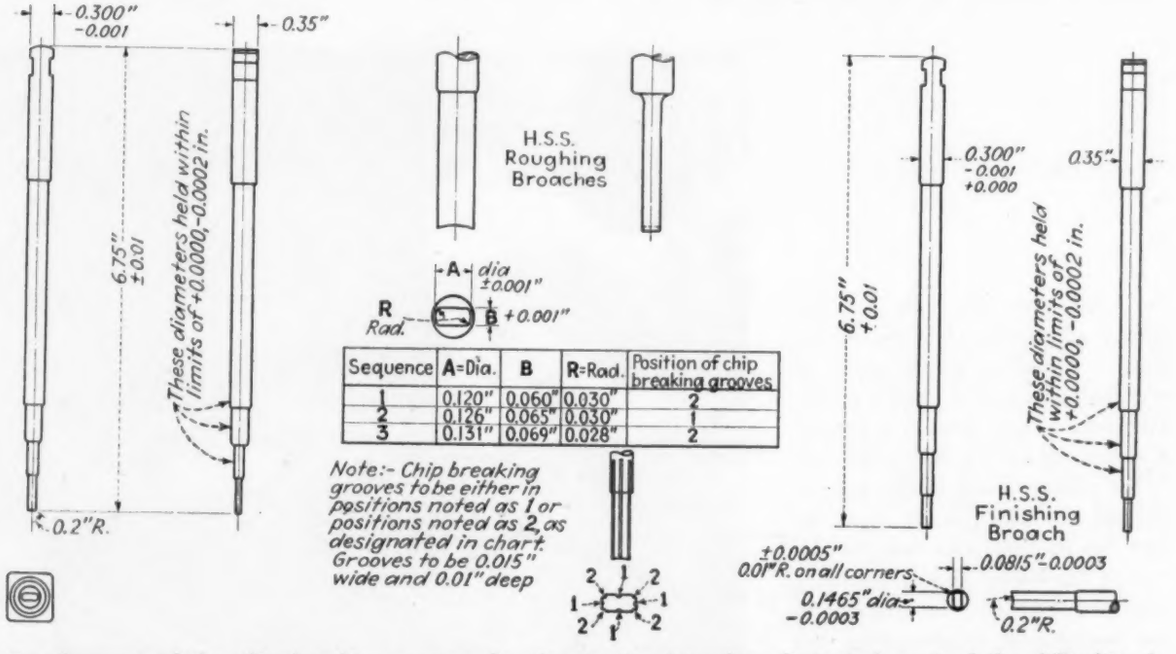
Next, the centers are rectified with piloted countersinks. These operations are performed in a two-spindle sensitive drill press placed in the production line. When countersinking the large center hole, the other end of the piece is supported on a cone directly below the spindle. These two center holes must be concentric, so as to locate the piece for milling operations which follow. After milling, the two sides are surface ground so that they are within 0.0002 to 0.0003 in. of the specified distance from the axis of the hole, and are parallel planes. For this operation, the piece is supported between centers in a special fixture on the surface grinder, the fixture having a jack support which prevents deflection of the piece under pressure of the grinding cut.

Following operations include a number of milling cuts and grinding operations to bring the block to its rough shape. Then, the firing pin hole is finish broached in a hand-operated fixture. There are nine basic broaches put through this hole, the first broach removing 0.002 in. on a side and each succeeding broach taking a lighter cut. Castor oil is used as a lubricant during each broaching cut, and each broach except the last two of the basic nine have chip breaker grooves ground parallel to the axis, in alternate positions (sides and ends, or corners). Sometimes two or three final broaches are put through to bring the hole to size, if the last broach of the series of nine has worn a bit small.

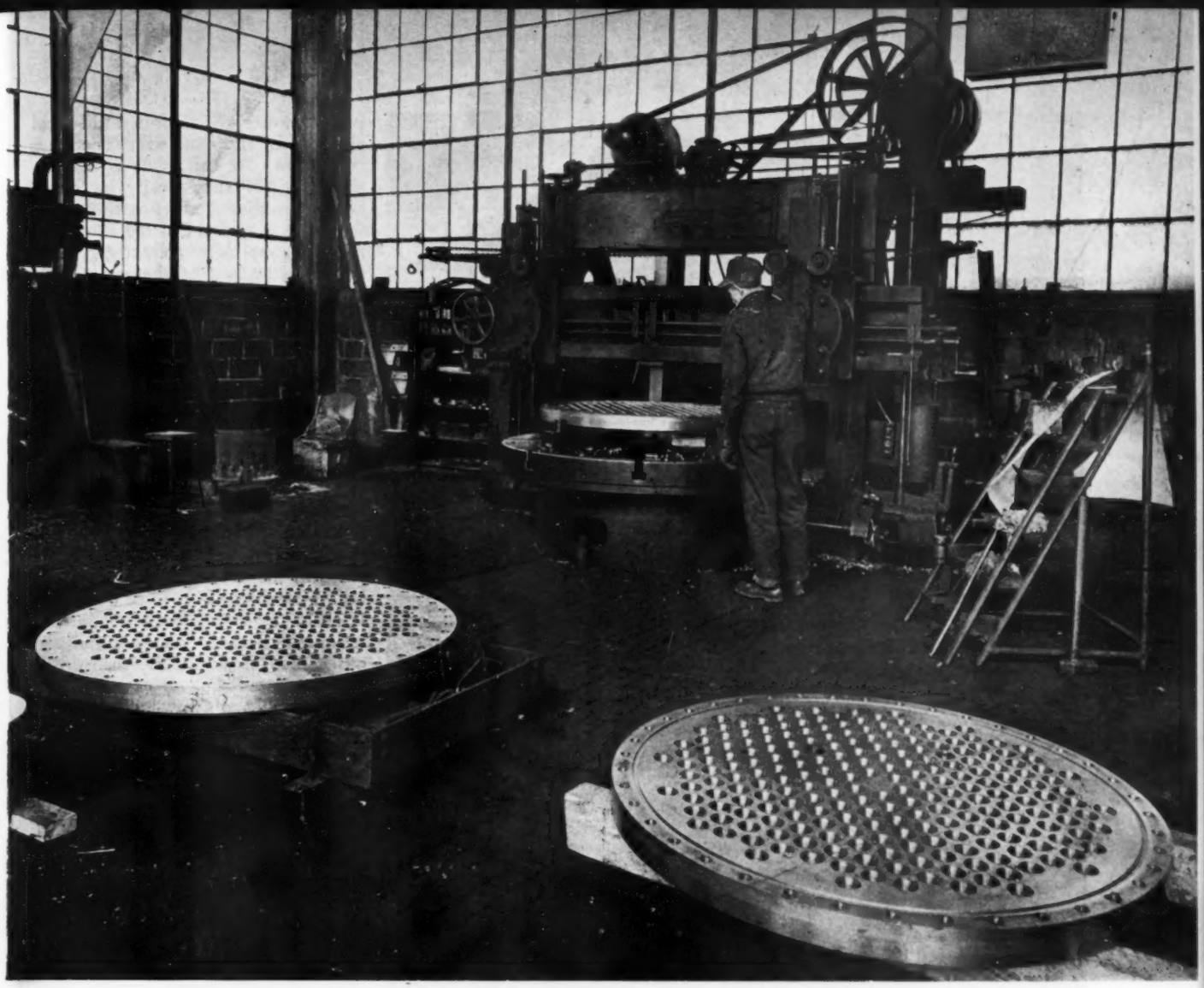
This hole must be on the center line of the other holes in the piece, so that the firing pin will drop into place without catching, and will fall out when the piece is turned in a vertical position.

Next, the cartridge seat is finished within very close limits, using an end mill in the spindle of a standard horizontal milling machine and holding the piece in a fixture which feeds against a 0.001 in. indicator for accurate depth of cut. This operation and the next, which consists of milling a 4-deg. taper on the top side of the cartridge seat, requires special care, as the limits for accuracy and finish are very important. The last operation before the first major inspection of this piece is the reaming of the firing pin holes.

Milling, profiling, drilling and grinding operations then finish the piece, allowances being made on these cuts for shrinkage during heat-treating and shot-blasting. Bench operations remove burrs and sharp edges, and blend some of the surfaces. Then 36 gages are used to inspect the piece. Next the piece goes to the heat-treating department, where it is carburized to a depth of 0.015 to 0.025 in. on most surfaces, being protected against carburization locally along some of the radii. Then, it is hardened to Rockwell C 70 at specified points and annealed at one point. Four shot-blast operations follow heat-treating, then the pieces are returned to the shop promptly so that they will not rust before being completed.


0.300" -0.001
0.35"
6.75" ±0.01
These diameters held within limits of +0.0000, -0.0002 in.
0.2"R.
H.S.S. Roughing Broaches
A dia ±0.001"
R Rad.
B +0.001"
Sequence | A=Dia. | B | R=Rad. | Position of chip breaking grooves
1 | 0.120" | 0.060" | 0.030" | 2
2 | 0.126" | 0.065" | 0.030" | 1
3 | 0.131" | 0.069" | 0.028" | 2
Note:- Chip breaking grooves to be either in positions noted as 1 or positions noted as 2, as designated in chart. Grooves to be 0.015" wide and 0.01" deep
0.300" -0.001 +0.000
0.35"
6.75" ±0.01
These diameters held within limits of +0.0000, -0.0002 in.
H.S.S. Finishing Broach
±0.0005" 0.01"R. on all corners
0.1465" dia -0.0003
0.0815" -0.0003
0.2"R.

Development of the chip breaking grooves for the starting broaches eliminated most of the difficulties in broaching the firing pin hole in the breech block. The first broach removes approximately 0.002 in. of material on each side, each succeeding broach removes less and less material



Stainless steel tube sheets 4 in. thick have 240 holes drilled in them on a boring mill

Welding Stainless Pressure Vessels

BY G. H. SANDBERG, WILSON WELDER & METALS COMPANY

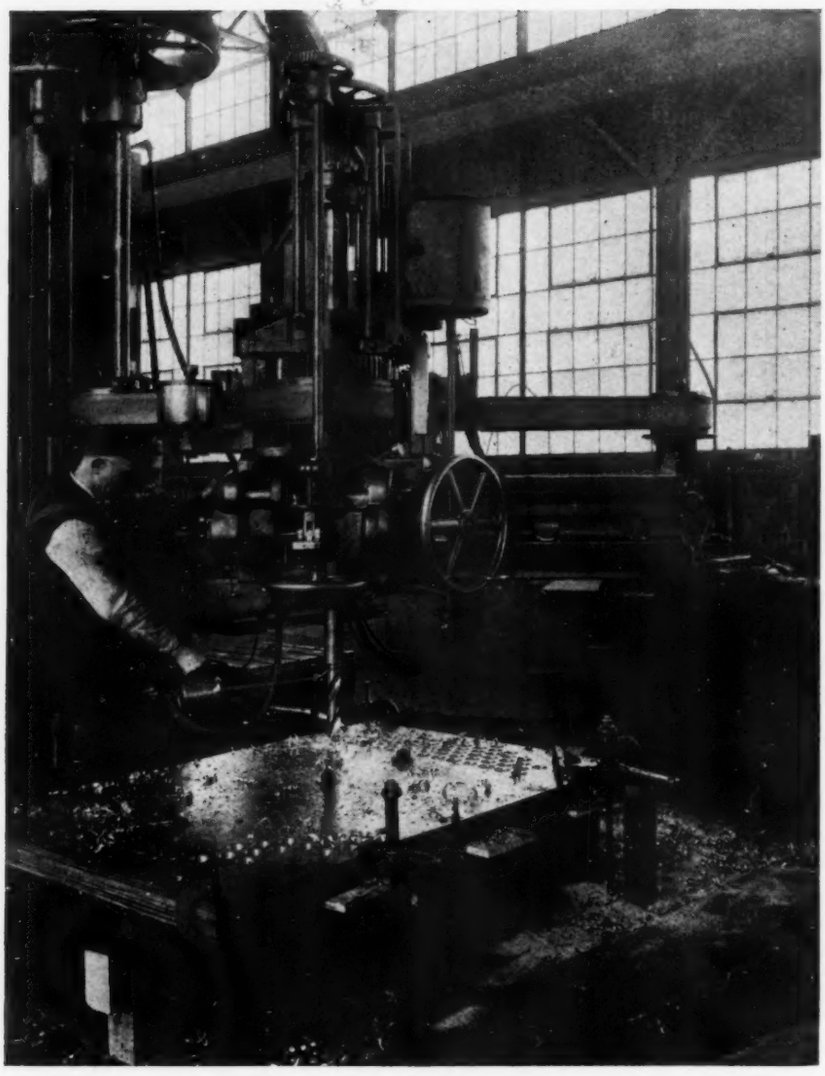
Successful welding of stainless steel to meet the boiler code requirements is dependent on careful preparation of the work

MANY NEWLY developed materials have wide potential applications; the problem is to produce them on a large enough scale to make the cost competitive. A demand for new and larger types of pressure vessels, many of which cannot be fabricated from plain carbon steel has developed in the chemical processing industries which are producing new synthetic materials. Stainless steel of the 18–8 type has been one of the favorites because of the wide range of materials which it can store without damage either to the container or the contents.

In the plant of the Edge Moor Iron Works, the fabrication of boilers and pressure vessels to meet boiler code requirements is a specialty, and engineered procedures for manufacturing fired and unfired pressure vessels of stainless steel and other special alloys have been highly developed. A large solid stainless steel heat exchanger, 54 in. in dia. and 22 ft. long illustrates the features of this type of weld fabrication.

The shell plate used in this construction was $\frac{3}{4}$-in. solid stainless plate. The tube sheets were cut from 4-in. thick stainless plate and the vessel was fitted with four forged welding flanges of 4-in. thick stainless. These are costly materials and no chances can be taken on losses through spoiled work.

This heavy construction does not necessarily involve any special changes



Alignment of the baffle plate holes is assured by stack drilling eight 1/2-in. stainless plates at once

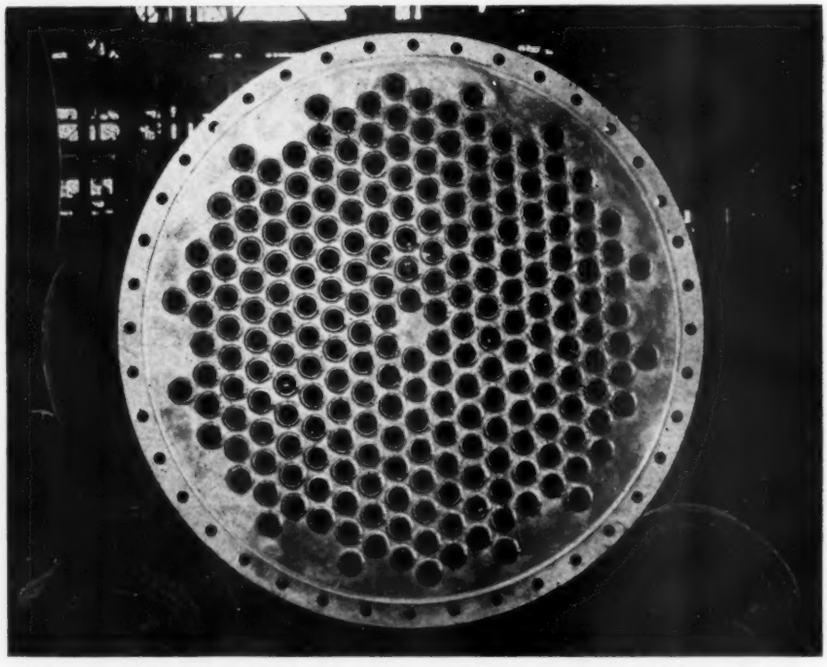
in the welding techniques, provided the standard of welding quality is what it should be for these alloys. It is always necessary when welding stainless steel to train the operators so that they can deposit perfectly sound metal regardless of the thickness of the section on which they are working.

Electrodes are selected on the basis of their suitability for the specific alloy that goes into the fabrication. This involves a definite amount of checking for each code vessel or group of vessels made from the same alloy. Coated electrodes are always used, and usually they are of the reversed polarity type, in which the cable to the electrode holder is connected to the positive terminal post of the arc welding generator, so that the direction of flow of the current is from the electrode to the work.

Welding current used is about 10 percent lower than for a mild steel electrode of the same size. There are two reasons for this. One is that the chrome-nickel alloy steel wire has a higher electrical resistance than mild steel; the second is that the alloy steel has a lower heat conductivity and therefore the heat of the arc is more closely confined to the weld zone.

Another important property of the stainless is that it has a relatively high coefficient of expansion. On this account extra care is exercised in the inspection of supporting and clamping devices before welding is started. High precision is maintained in the fit-up operations, as a precaution against defects that might be caused by misalignment.

In other words, the entire success of the fabrication depends upon the care taken in the preparation of the material. First things have to be done first. If all of the separate parts of the vessel were cut and shaped simultaneously, there is always the chance that the parts would not fit exactly in the final assembly, which would mean that the fabricator would have his choice between forced fits and lack of precision in alignment. Since the tube sheet is the heaviest section, this is the first piece to be completed. After the tube holes and the bolt holes have been drilled, it is machined to size at a boring mill. Then its dimensions can be used as a final check on the cutting and shaping of the shell plate. In order to get the exact fits that are required, shell plates are rough cut



The completed tube sheet after all tubes have been welded into position

slightly oversize and machined to exact size on the 30-ft. planer. Then they are rolled just enough out of round so that the contraction of the weld metal when it cools will draw the shell into a perfect cylindrical shape. The greatest emphasis is placed upon accurate machining of all parts to very close tolerances and on checking alignment at every stage of the assembly operation, so that there are no offset joints to interfere with perfect penetration or set up uneven stress distribution.

A similar preparation method is adopted for other types of vessels. In the case of one having a dished head, for example, the head is cut to size and machine beveled for welding, then its circumference is accurately measured to determine the corresponding dimension of the shell plate. After the shell plate is formed and welded longitudinally, it is fitted to the dished head and if any difference in curvature is observed, the shell is put back on the rolls and reshaped so that it fits the head for the whole length of the periphery.

The final welding on these constructions is therefore no more difficult than welding on light sections of the same material, because no final welding is allowed to proceed until the entire joint has been rigidly inspected and found to be in perfect alignment and consequently in an ideal condition for ease of welding.

Deposition technique is characterized by the same need for uniformly sound metal that is mandatory for code welded vessels of carbon steel. Care is exercised to avoid an unduly long arc or accidental reversing of the polarity. Welding with a fairly close arc assures that the metal flowing across the gap will be fully protected from the atmosphere by the protecting blanket of incandescent gases which the coating supplies. This is particularly important because otherwise the chromium would tend to unite with the atmospheric oxygen. Another outstanding factor in correct technique is the thorough chipping of the top of each bead before depositing another bead over it.

X-ray inspection is used to insure that these procedures have been carefully followed. At Edge Moor, the X-ray machine is located in a room beneath the welding bay, and special tracks are provided so that welded assemblies can be moved over it. Roller mountings on the trucks permit drums to be rotated for inspection of circumferential seams. This arrangement minimizes the amount of floor space required for X-ray inspection, and allows it to be done with the least inconvenience to other jobs.

A completed welded stainless steel processing tank, ready for the final inspection and shipment

Heat-treatment of stainless pressure vessels differs considerably from the thermal stress relief treatment that is a requirement for similar vessels of carbon steel. When the 18–8 alloy is held for a short period at a temperature of 900 to 1,500 F. and allowed to cool slowly some of the chromium unites with the carbon, forming carbides, and reducing the corrosion resistance of the area in which the loss of chromium occurs. In general the deposited weld metal cools rapidly enough to escape this effect, but the nearby parent metal undergoes this phenomenon of carbide precipitation, which can only be eliminated by heating above the precipitation range of temperature and cooling quickly. Facilities are therefore provided for heating to 2,000 F. and quenching within 3 min. after the temperature is checked. Quenching of small assemblies can be done by immersion, and when this is not practicable a water spray is used.

Columbium is frequently added to the chrome-nickel steels as a stabilizing element. Its function is to unite with the carbon and leave the chromium in solution, so that its corrosion resisting quality is not impaired. Since carbide precipitation occurs principally in the parent metal near the fusion zone it is obvious that a columbium bearing electrode is effective in preventing precipitation only when columbium is also present in the parent metal.

In one respect the 18–8 alloy is fairly easy to weld. It deposits easily and smoothly when the current is properly adjusted. However, the material has metallurgical properties which may lead to invisible defects. The procedures described have been developed to eliminate such hidden defects, so that this valuable alloy can be weld fabricated satisfactorily for the most exacting service.

Uses of Sintered Silver Increasing

The use of silver in powdered metallurgy is increasing. It is employed for making mechanical mixtures containing metals, such as nickel, which do not alloy with silver except in small proportions. Graphite, tantalum, molybdenum and tungsten are among the materials mixed in finely powdered form with silver powder, compressed and sintered.

Some resulting products can be rolled into sheet or drawn into rod which are used, at present, chiefly for making electrical contacts and welding electrodes, though other applications are contemplated. Even wire suitable for heading operations is produced, since silver itself is ductile and helps to form ductile mixtures. It is possible to make mixtures almost as dense as might be expected if complete alloying were possible. On the other hand, if an ingredient is added which can be volatilized after pressing has been done, a uniformly porous product results.

Heat-Treating Jack Parts

With many sizes of parts made from a variety of materials, the heat-treating department must be versatile and well arranged

JACKS INVOLVE a diversified list of parts, many of which require heat-treatment to insure adequate strength and dependable service. For this reason, Templeton, Kenly & Company, who make some 200 different types and sizes of industrial jacks, operates its own heat-treating department. Jacks of the types in question are made in batches, hence the heat-treating is done on a batch rather than on a continuous basis. The size as well as the quantity of parts varies continuously and many different materials, often necessitating quite different heat-treatment, are employed. These factors make a flexible set-up essential. Although the equipment is simple, it is well arranged and well adapted for the variety of work it must handle.

Most of the equipment employed can be seen in the accompanying general view of the department. Furnaces and drawing equipment are placed along the right and left walls, as seen in this view, and most of the space between these rows is given over to quenching and cleaning tanks and to wide aisles along which parts to be processed are stored temporarily when they cannot be treated as rapidly as received.

Furnaces Manually Controlled

Furnaces are mostly small Stewart semi-muffle gas-fired types having fire brick hearths and monolithic top and arches. Firing is controlled by hand-operated valves, but all furnaces are equipped with thermocouples connected through switches to a centrally located Bristol pyrometer. A careful check is kept on temperatures to make sure that the parts are given the heat-treatment specified. As the individual parts are not heavy, batches of small parts in baskets can be handled with hand tongs or an electric hoist.

Many of the forgings, especially those made from alloy steels, such as SAE 3145, 3250 and 4150, are annealed before machining. They are heated slightly above the critical point, usually from 1450 to 1650 F., and then are allowed to cool slowly to about 900 F. at which point they are held for about two hours. This is followed by slow cooling to room temperature taking perhaps eight hours during which the parts remain in the furnace, usually over night. After machining, parts are brought slowly up to temperature, usually 1,450 to 1,600 F., and after 15 min. of soaking at this temperature are quenched.

There are two quench tanks about 8 ft. square, one for oil, used for all alloy steels, and one for water. Quenching oil with a 420 F. flash point is used and it is kept at a temperature under 120 F., as far as possible or at highest below 160 F. This is done by drawing oil off the top by a pump, circulating it through double-wall pipes having cooling water in the outer pipe, and returning the oil to the bottom of the tank into which it enters in jets which keep the oil agitated and circulating. Large parts are placed in the tank with tongs, one at a time, by two to four men and baskets of smaller parts are handled by an electric hoist. Usually parts are left in the quench tanks for about 10 or 15 min. The water quench tank is similarly arranged except that it is kept cool with city water brought in near the bottom of the tank. Hot water flows to waste through a drain near the top.

Baskets of quenched parts are removed from the tanks by an air hoist on a trolley and individual large parts are placed into similar containers by tongs. Containers are then lowered into a tank of boiling alkaline cleaner, heated by gas and agitated by compressed air. Cleaning is designed to remove oil and other foreign matter and continues for five minutes, after which parts are rinsed in hot water and are ready for drawing.

Drawing is done in a salt bath which melts at 375 F. and has a working range of 375 to 1000 F., although used mostly at 600 to 900 F. Most of the alloy steels are drawn at about 800 F. and the average time for drawing is one hour. The bath is kept hot with gas which, like that used in furnaces and for other heating, is first compressed to about 15 psi., so that no blowers are required. Drawing is done with the parts on racks or in baskets which are lowered into and removed from the bath by air hoist.

Parts which require case hardening are handled in one of two cyanide baths of the Aerocase type known as No. 28 and No. 510. These are heated to about 1,650 F. and the work remains in them for one to two hours, giving a case from $\frac{1}{64}$ to $\frac{1}{32}$ in. thick. This treatment is followed by quenching in water.

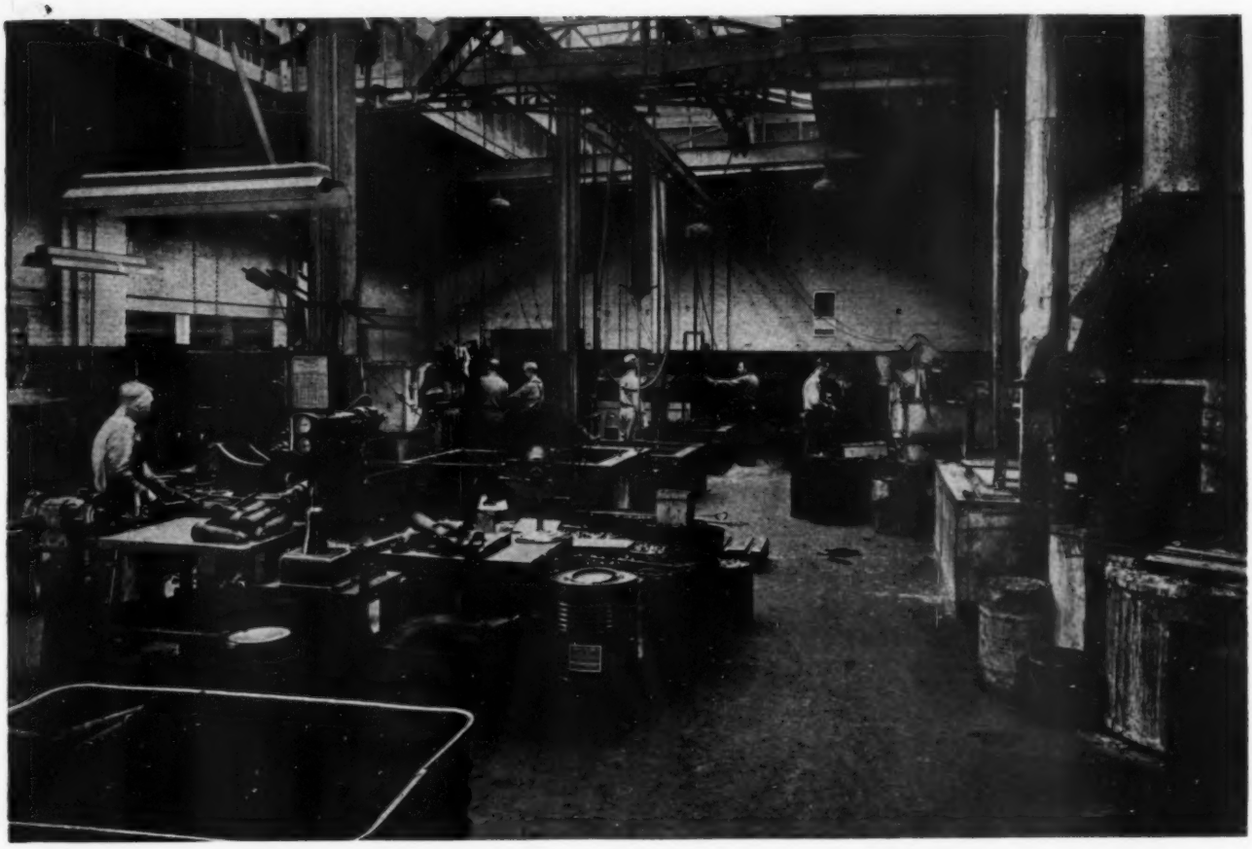
An important piece of equipment in the heat-treating department is the Brinell hardness tester which is used on nearly all jack parts whether they are heat-treated in the department or not. This tester is shown in use in the second illustration. To the left of it is a grinder used to clean scale from the surface to be Brinelled and at each side of the tester are steel benches over which the parts are handled before and after testing.

Hammer Used for Forming

Other equipment used in the heat-treating department includes a small forging furnace and a Bradley hammer of the vibrating type which are used for shaping the pinch-bar ends of the levers with which some types of jacks are equipped. This equipment handles bars up to 1-in. diameter and makes use of much lighter and less expensive dies than would be needed for drop forging, but is much faster, than hand forging. Bars shaped in this way are subsequently heat-treated and quenched to harden the end forged.

A small furnace designed for temperatures up to 2,600 F. is employed for heat-treating tools of high-speed steel for use in the plant. In the department there is also a hydraulic press designed for straightening parts which may be warped in heat-treatment. Two 30-in. suction fans and two portable floor fans help to keep the department free from fumes and as cool as conditions permit. A large skylight also helps ventilation and supplies ample light for day shifts. Some fluorescent and some incandescent lights are provided for night work. In one corner of the department is a centrifugal pump with motor for circulating the quenching oil and along one wall above the pump are the cooling coils through which the quenching oil is circulated.

From the foregoing it should be apparent that the department is well designed for the work required and this work is done economically and efficiently. Investment in equipment is modest considering the volume and character of the work done.



Seen in this general view of the heat-treating department are the cyanide hardening furnaces and salt bath at the right. The quenching tanks and storage for parts awaiting heat-treatment is in the center

The Brinell hardness tester in use. Tables at right and left of the machine are for parts awaiting and following test

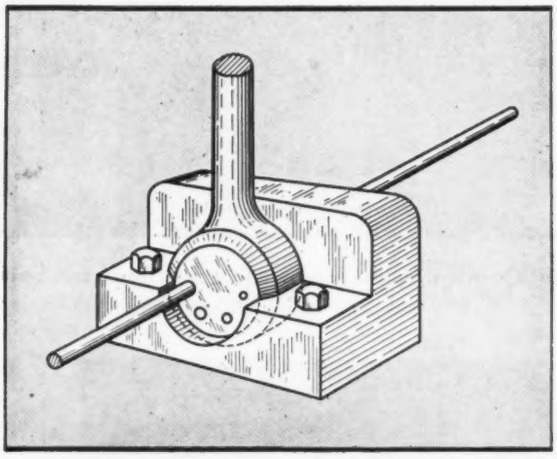
IDEAS FROM PRACTICAL MEN

Bench Tool Cuts Bar Stock

BY A. K. BAKER

A simple bench tool which will cut several sizes of bar stock can be easily made in any tool shop. A jacket is made with holes bored in the side in which will fit the desired sizes of bar stock. This jacket is bolted to the bench top.

A second part is made to fit the jacket and has matching holes bored through it. A handle of suitable length is attached to this part. In operation, the bar stock is shoved through the proper holes in the two parts. Pulling the handle provides a leverage which turns the smaller part in the jacket and shears off the bar stock. Larger holes should be placed in the rear so that a foot can be braced against the bench for shearing the heavier sizes.



This simple bench tool will cut several sizes of bar stock. It can be made in any tool shop

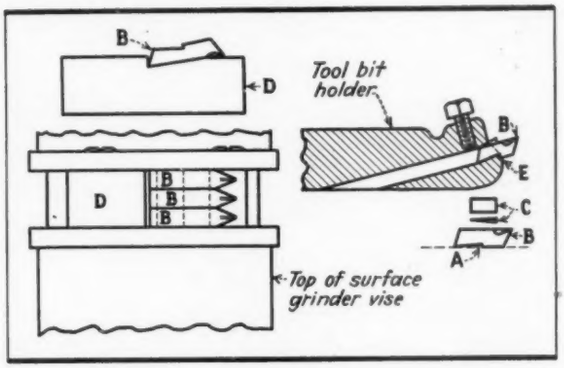
How to Use Short Tool Bits

BY GEORGE J. MURDOCK

Part of every tool bit is ordinarily wasted because it, from service, is too short to be held securely by the setscrew in the holders generally used.

This loss may be reduced materially by grinding step *A* in the bottom of discarded bit *B* so that the bit cannot be forced back by the cut farther than the end of the step, which will strike the lip of the hole. This will leave a taper opening above the bit.

A discarded power hacksaw blade is broken off at one end and ground into wedge *C* about $\frac{1}{2}$ in. long and the width of the bit. If this wedge is made with care it can be used repeatedly.



Tool bits which are too short to be held by the setscrew can be held by grinding step *A* in the bottom of the bit and driving wedge C, made from an old hacksaw blade, in above the bit

The wedge is driven into the opening above the bit. This will hold the bit as securely as when new, yet it may be readily removed by driving it out with a punch on its inner end.

In order that the cost of grinding the step does not offset the saving effected by this method, parallel *D* is made with an angular cut in its top. This is made with a thickness slightly less than the combined width of the bits to be ground at one time. The bits are laid bottom up in this recess in the parallel and clamped by the jaws of the grinder vise. A cut is taken which is about $\frac{1}{32}$ in. deep at the end. This should be square, as should the holder at *E* so that the bit will not shift sidewise when wedged in position.

Index Bases Speed Milling Operations

BY FRANK HARTLEY

The possibilities for multiple production by the use of index bases should not be overlooked in tooling for increased production. A set-up in which four parts are mounted in a fixture is shown in Fig. 1. Two parts are carried at each end; there is an index pin in the center about which base *A* pivots on unit *B* which is attached to the milling machine table. Cutters *C* and *D* operate on two parts at a time.

Body *E* of the fixture has two clamps *F* mounted pivotally at the center so that tightening hand knob *G* clamps parts *H* and *I* with lug *J* and stud *K*. In the same manner hand knob *L* is tightened to hold the parts being worked on by the cutters. Hand knob *M* is used for side clamping part *H* while hand knob *N*

performs the same function at the cutting end of the set-up. Two small diameter cutters *C* mill narrow boss *H* while large cutters *D* are used to mill wide boss *I*, when indexed into position.

In using this fixture work at one end is fed against the cutters while the operator is placing two parts in the other end of the fixture. A latch pin and locking bolt in the index base is released and the upper section of the base turned through a half revolution and clamped, ready for milling the next two bosses.

An index base of more complicated nature is shown in Fig. 2. The three views of this set-up show two work stations each carrying four parts *A*, with loading platform *B* under one station.

The operation consists of milling square ends on four parts at a time, accomplished by four straddle milling cutters *C* passing across the lower ends of the work twice as indicated by arrow *D*. At the first pass two flats are milled on each part after which the operator moves hand knob *E* through 90 deg. to position *F*. This rotates the work into position for milling the other two flats on the second pass.

The construction of the swivel is such that four chucks *G* hold the work while milling; they are tightened by a spanner wrench. Swivel *H* is held in place by cap *I* with a snug fit to absorb vibration. The arbor and milling machine frame are indicated by *J*.

The index base pivots on stud *K* and lower member *L*. The two sections are carried in housing *M*, there is a lever at *N* which enters either one of two holes to locate the housing in either of the two positions. The housing is clamped with a socket wrench by tightening nut *O*.

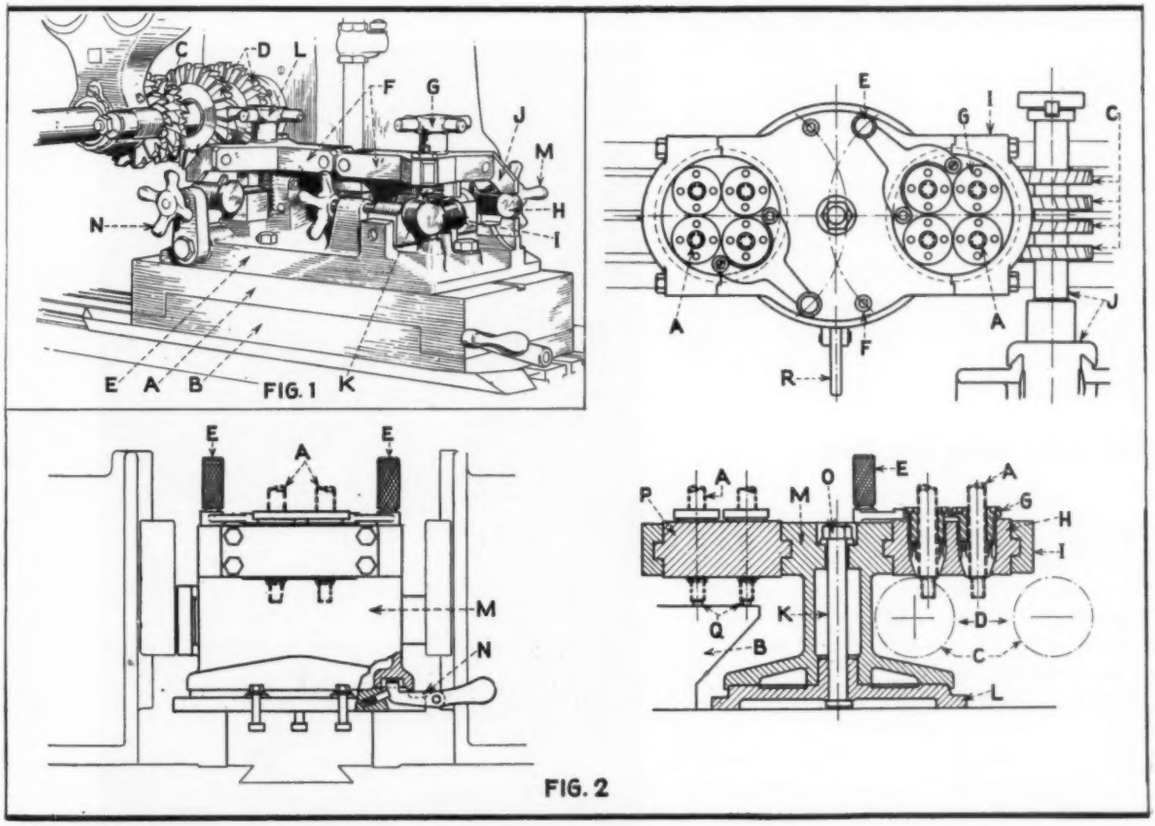
Swivel unit *P* is shown over loading platform *B*. Four parts are placed in the chucks with their ends resting on pins *Q*. This locates them in the correct vertical position for milling when revolved on the base through 180 deg. to milling position *H*. All the operator does is load over *B*, loosen nut *O*, trip lever *N*, index the unit and tighten nut *O*, after which the parts are in position for milling.

Truing Worn Tool Rests

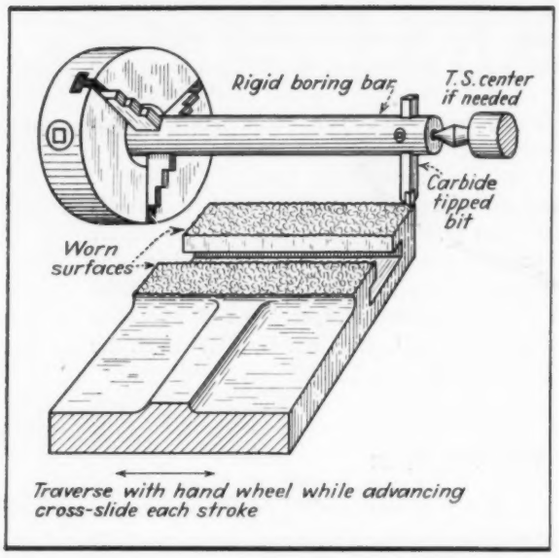
BY LAURENCE F. SOUTHWICK

On lathes which have seen much service, particularly hurried and not too careful service, the tool rest (that part of the compound rest against which the tool sup-support ring is clamped) is apt to show much wear.

This can be trued up by converting the lathe temporarily into a planer. The spindle is put into back gear and the chuck is tightened on a large, rigid boring bar which has a 90 deg. cross hole at the outer



The possibilities for multiple production resulting from the use of index bases are indicated by these two examples. Fig. 1 shows a fixture holding two different parts for milling while the operator loads the other end of the fixture. In Fig. 2 four identical parts are held in each end of the fixture


Rigid boring bar
T.S. center if needed
Carbide tipped bit
Worn surfaces
Traverse with hand wheel while advancing cross-slide each stroke

A worn tool rest on a lathe can be trued up by converting the lathe temporarily into a planer

end. A carbide tipped bit is used as the cutter. It should be set to take a cut only deep enough to clean up the entire surface.

The compound rest is swung into position so that the long dimension of the tool rest traverses the planer tool as the carriage is cranked back and forth by hand. At the beginning of each stroke the cross feed is advanced by an amount depending on the shape of the tool point, the amount of stock to be removed, the gear ratio of the hand wheel, and good planer practice.

In our case, I advanced the cross feed 0.10 in. per stroke with a sharp pointed tool. The whole operation required about an hour and the result was a dead-true, fine-finished surface.

Depth adjustment is easily provided by setting the cutter at a slight angle instead of straight up and down so that a slight jog on the drive will turn the tool point down deeper.

Cam Milling with a Radial Drill Press

BY B. K. ARTHUR

A creditable job of semi-automatic profiling or cam milling on a production basis is being done in our shop with a large radial drill press. Clamped to the base table is a large gear reducer having a vertical shaft on which is mounted a face plate or chuck as the job requires. The motor which drives the gear reducer is separate from that which drives the radial spindle but both motors have common controls.

The rough piece to be profiled is clamped by means of studs screwed into the face plate which pass through the work and also through a hardened master plate about $\frac{3}{4}$ in. thick. The master plate is held off the work by means of spacer pads about $\frac{1}{4}$ in. thick.

The end mill or profiling tool is chucked in the radial spindle. The body of this tool is the same diameter as the cutting edges, and is smooth and hardened. The radial arm is left loose, so that the head can be swung easily. A heavily weighted cable is run over a pulley and attached to the arm so as to swing the head towards the work.

When the end mill is revolving it will machine away the work until the smooth portion of the body of the end mill bears on the hardened steel master plate. The revolving master plate pushes the radial arm away from the center of the work and the weighted cable pulls it toward the work.

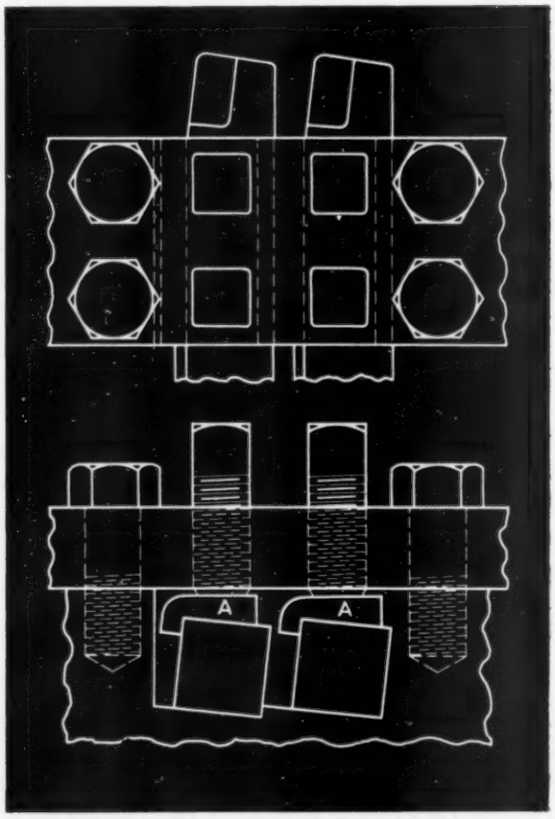
Tool-Bit Clamp Reduces Grinding

BY MARTIN H. BALL

A minimum amount of grinding is required on the top surfaces of tool bits held in the clamps shown in the drawing. The clamp can be used in close quarters and provides strong clamping features.

The bit rests on a 7-deg. angle surface which provides a top rake suitable for average jobs. Shouldered top plates *A* are also made with a 7-deg. angle on their lower surfaces, thus affording a flat upper surface upon which the setscrews bear.

This method secures long life of tool bits and by setting them at an angle reduces grinding on their top surfaces.



Grinding of tool bits is reduced by using this clamp which holds the tools at a 7-deg. angle

AMERICAN MACHINIST REFERENCE BOOK SHEET

Emergency Steel Specifications—I

CHANGES IN steel specifications to further the production drive and thus meet the demands of the war effort were announced on March 7, 1942, by the War Production Board. The changes are designed to conserve the supplies of steel alloys. With the rapid increase in production, it has become evident that unless steel alloys are conserved, there will not be enough for both the war program and essential civilian demands.

In anticipation of this shortage, representatives of the steel industry, the Society of Automotive Engineers, the Iron and Steel Institute, and other technical bodies were called together by the War Production Board to discuss national emergency steel specifications.

The conservation of alloying elements in these specifications is based upon the principle that small quantities of several alloys are more effective than large quantities of any single one.

It appears that these national emergency steels and certain others containing less strategic elements, or none, will soon be the only steels available. It is therefore imperative that industry take the necessary steps to change over as quickly as possible, so as to be prepared when the supply of habitually-used steels is cut off.

Steels containing the strategic elements nickel, chromium, tungsten, cobalt and vanadium may only be used on extremely important functional parts. Hence, industry is urged to use carbon and intermediate manganese steels (1000, 1100 and 1200 series), carbon-molybdenum steels (4000 series), manganese-molybdenum steels (8000, 8100, 8200, 8300, 8400 and 8500 series), or silico-manganese steels (9200 series) wherever possible. The analyses of the alternate steels which will be available are given in Table I, while existing steel specifications with the National Emergency equivalents are given in Table II.

Those interested in obtaining these steels can apply to their regular steel sources. Heats have already been made by a number of companies, including the following: Bethlehem Steel Corporation, Carnegie-Illinois Steel Company, Copperweld Steel Company, Pittsburgh Crucible Steel Company, Republic Steel Corporation, Rotary Electric Steel Company, Timken Steel & Tube Company, and Youngstown Sheet & Tube Company.

In the early stages of this program it may not be possible for a user to obtain the exact bar size or shape to which he is accustomed, and it may be necessary to accept some other size and possibly even a forged bar in order to carry out a test program. Test steel should be ordered in the usual manner.

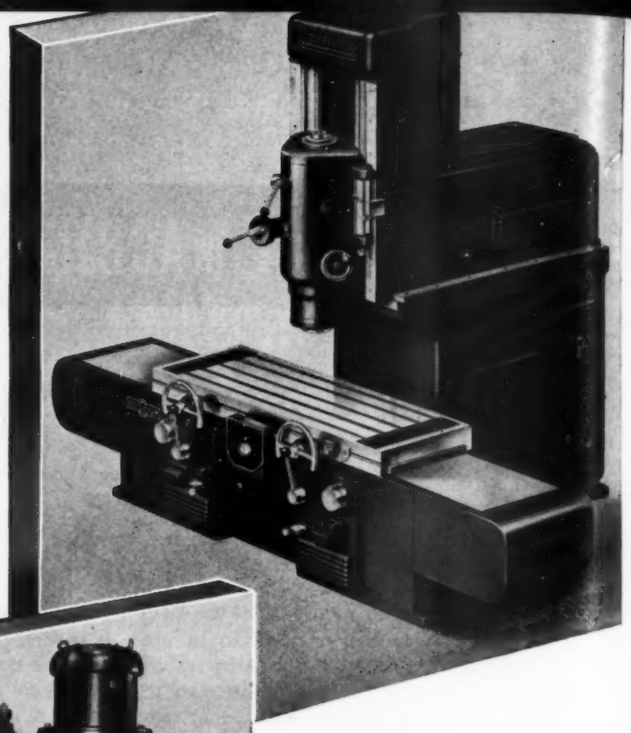
Table I—ANALYSES OF NATIONAL EMERGENCY STEELS

SAE or AISI Number	Carbon	Manganese	Nickel	Chromium	Molybdenum
A 4027	0.25–0.30	0.70–0.90	.....	.....	0.20–0.30
A 4037	0.35–0.40	0.75–1.00	.....	.....	0.20–0.30
A 4047	0.45–0.50	0.75–1.00	.....	.....	0.20–0.30
A 4063	0.60–0.67	0.75–1.00	.....	.....	0.20–0.30
A 4068	0.64–0.72	0.75–1.00	.....	.....	0.20–0.30
NE 8024	0.22–0.28	1.00–1.30	.....	.....	0.10–0.20
NE 8124	0.22–0.28	1.30–1.60	.....	.....	0.25–0.35
NE 8233	0.30–0.36	1.30–1.60	.....	.....	0.10–0.20
NE 8245	0.42–0.49	1.30–1.60	.....	.....	0.10–0.20
NE 8339	0.35–0.42	1.30–1.60	.....	.....	0.20–0.30
NE 8442	0.38–0.45	1.30–1.60	.....	.....	0.30–0.40
NE 8447	0.43–0.50	1.30–1.60	.....	.....	0.30–0.40
NE 8547	0.43–0.50	1.30–1.60	.....	.....	0.40–0.60
NE 8620	0.18–0.23	0.70–0.95	0.40–0.60	0.40–0.60	0.15–0.25
NE 8630	0.27–0.33	0.70–0.95	0.40–0.60	0.40–0.60	0.15–0.25
NE 8724	0.22–0.28	0.70–0.95	0.40–0.60	0.40–0.60	0.20–0.30
NE 8739	0.35–0.42	0.75–1.00	0.40–0.60	0.40–0.60	0.20–0.30
NE 8744	0.40–0.47	0.75–1.00	0.40–0.60	0.40–0.60	0.20–0.30
NE 8749	0.45–0.52	0.75–1.00	0.40–0.60	0.40–0.60	0.20–0.30
NE 8817	0.15–0.20	0.70–0.95	0.40–0.60	0.40–0.60	0.30–0.40
NE 8949	0.45–0.52	1.00–1.30	0.40–0.60	0.40–0.60	0.30–0.40

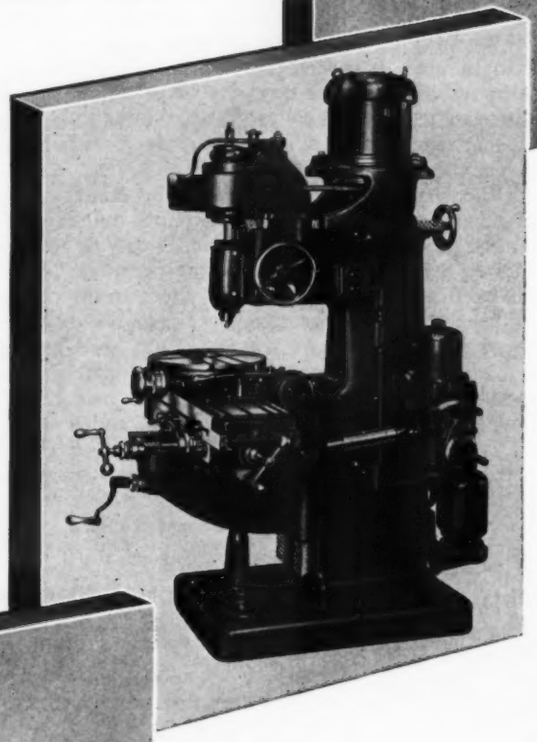
All of the above steels contain 0.20–0.35 silicon and 0.040 maximum each of sulphur and phosphorus.

In addition to the above, the usual plain carbon (1000 series), high sulphur (1100 series), high phosphorus (1200 series) and silico-manganese (9200 series) steels are available in the various carbon ranges, as are, also, certain other carbon-molybdenum (4000 series) steels.

MODERN MILLERS
for quick Delivery



Anticipation of War Production needs enables us to make quick delivery of the machines shown due to expanded facilities. Equipment bearing the Reed-Prentice name meets with the acceptance of government technicians and is widely used in the production of both Army and Navy armaments.

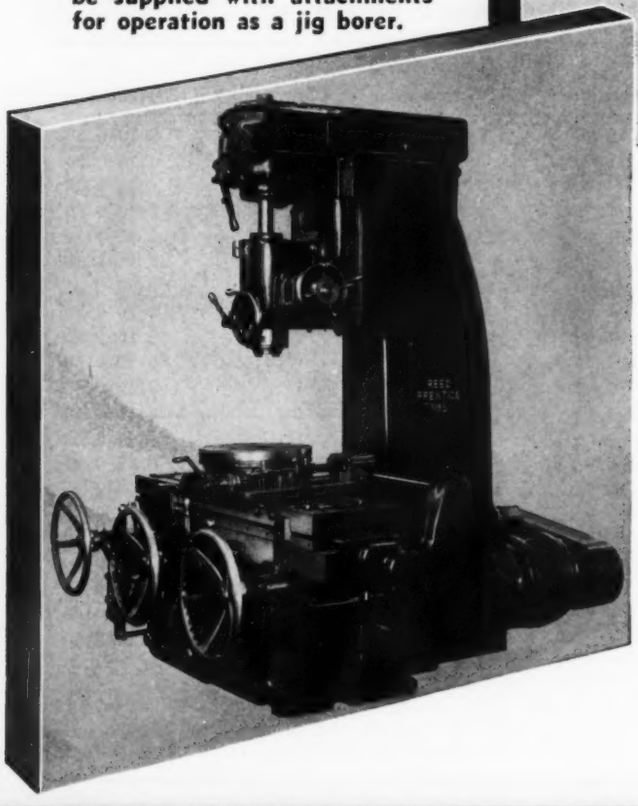


No. 4 (Above)
Vertical Miller

No. 4 Vertical Miller, entirely new in design, featuring infinitely variable table and cross slide feeds 1" to 37" per minute.

No. 5 (Below)
Vertical Miller & Die Sinker

No. 5 Vertical Miller and Die Sinker, a machine capable of vertical milling and die sinking with wide range, power and accuracy. This machine can also be supplied with attachments for operation as a jig borer.



No. 3VG (Left)
Vertical Miller & Die Sinker

No. 3VG Vertical Miller and Die Sinker, with back geared spindle drive for wider spindle speed range.

SPECIFICATIONS	#4	#3VG	#5
Range — Longitudinal power feed	48"*	24"	48"
Cross power feed	24"	12" (Hand)	16"
Table — Working surface	24" x 70"	10¼" x 36"	16" x 66"
Size overall	24" x 84"	10¼" x 44"	16" x 68"
Max. distance spindle to table	24"	18"	30"
Spindle drive motor	10 HP	3 HP	7½ HP
Net Weight	18,000 lbs.	2850 lbs.	11,500 lbs.
* Can be supplied 60"			

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AMERICAN MACHINIST REFERENCE BOOK SHEET

Emergency Steel Specifications—II

Table II—STANDARD STEELS AND NATIONAL EMERGENCY EQUIVALENTS

STANDARD SERIES DESIGNATION				POSSIBLE ALTERNATES SAE or AISI Number		
1942 AISI Number	1941 AISI Number	1942 SAE Number	1941 SAE Number	Number	Number	Number
A 1320	A 1321	1320	....	A 4027	NE 8024	....
A 1330	A 1330	1330	1330	A 4037	NE 8233	....
A 1340	A 1340	1340	1340	A 4047	NE 8245	....
A 2317	A 2317	2317	2315	A 4027	NE 8024	NE 8620
A 2330	A 2330	2330	2330	A 4037	NE 8233	NE 8630
A 2335	A 2335	....	....	A 4063	NE 8339	NE 8739
A 2340	A 2340	2340	2340	A 4068	NE 8442	NE 8744
A 2345	....	2345	2345	A 4068	NE 8447	NE 8749
WD 2350	....	....	....	A 4068	NE 8547	NE 8949
A 2515	A 2514	2515	2515	A 4027	NE 8817	....
A 3045	A 3045	....	....	A 4068	NE 8442	NE 8744
A 3120	A 3120	3120	3120	A 4027	NE 8024	NE 8620
A 3130	A 3130	3130	3130	A 4037	NE 8233	NE 8630
A 3135	A 3135	3135	3135	A 4063	NE 8339	NE 8739
A 3140	A 3140	3140	3140	A 4068	NE 8442	NE 8744
A 3141	A 3141	3141	X3140	A 4068	NE 8447	NE 8749
A 3145	A 3145	3145	3145	A 4068	NE 8447	NE 8749
A 3150	A 3150	3150	3150	A 4068	NE 8547	NE 8949
A 3240	A 3240	3240	3240	A 4068	NE 8442	NE 8744
WD 3250	....	....	....	A 4068	NE 8547	NE 8949
A 4119	A 4119	4119	....	A 4027	NE 8024	....
A 4130	A 4130	4130	X4130	A 4037	NE 8233	NE 8630
A 4137	A 4137	4137	....	A 4063	NE 8339	NE 8739
A 4142	A 4142	....	....	A 4063	NE 8442	NE 8744
A 4145	....	4145	....	A 4068	NE 8447	NE 8749
A 4150	....	4150	4150	A 4068	NE 8547	NE 8949
A 4320	A 4320	4320	4320	....	NE 8124	NE 8724
A 4340	....	4340	X4340	A 4068	NE 8547	NE 8949
A 4620	A 4620	4620	4620	A 4027	NE 8024	NE 8620
A 4640	....	4640	4640	A 4063	NE 8339	NE 8739
A 4645	....	....	....	A 4068	NE 8447	NE 8744
A 4650	....	....	....	A 4068	NE 8547	NE 8949
A 4820	A 4821	4820	4820	....	NE 8124	NE 8724
A 5045	A 5045	....	....	A 4063	NE 8339	....
A 5120	A 5120	5120	5120	A 4027	NE 8024	....
A 5130	A 5130	....	....	A 4037	NE 8233	....
A 5140	....	5140	5140	A 4063	NE 8339	....
A 5145	A 5145	....	....	A 4068	NE 8442	....
A 5150	A 5152	5150	5150	A 4068	NE 8447	....
A 6120	A 6120	....	....	A 4027	NE 8024	NE 8620
....	....	6130	....	A 4037	NE 8233	NE 8630
WD 6140	....	....	....	A 4063	NE 8339	NE 8739
A 6145	....	....	....	A 4068	NE 8442	NE 8744
A 6150	....	6150	6150	A 4068	NE 8447	NE 8749

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• Either as tools or as raw materials, alloy steels enter into the production of practically all war equipment. *Use these steels wisely; use them well!* That is an infallible way to speed up production; it is also the *only* way to conserve strategic materials . . . to spread the nation's supply of metals and alloys over the greatest possible amount of actual production.

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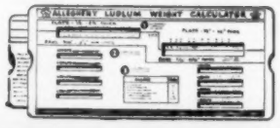

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Tool Up for Victory

AS THE war production drive gets under way, certain advantages possessed by American industry stand out.

It has far more machine tools installed in its factories than has any other nation in the world.

It is being supplied currently with far more new machine tools than the industry of any other nation—over 1,000 machines a day, 365 days out of the year, to be specific.

Our mechanized productive power isn't approached in volume by anybody else on earth. Our workers, on a per-man basis, are capable of producing more than those of any other country.

So far, so good. Those indisputable facts promise lots of future trouble for Berlin and Tokyo. But that is only part of the story.

We must go farther if we are to be sure of out-producing our enemies and of attaining the goals set by the President in the Victory Program.

For one thing, the right tooling must be provided for each machine tool. On that point Alfred Herbert, English machine tool builder, writing in The Engineer (London), makes a comment which applies with equal force here:

"If every machine tool in the country were fully tooled up and run continuously, we should be well on the way to salvation. . . . One machine tool with adequate equipment may well be more productive than two or three, which are struggling with incomplete or ill-designed tools. Machines without tools are no more effective than guns without ammunition."

The fault has been, in part, that in the hurried ordering of large masses of machine tools not enough information was at hand as to the precise purpose for which each machine was to be used. On top of that, many manufacturers have gone into production of war goods with an understandable lack of knowledge of how to tool up for the job most efficiently. They have bungled and blundered.

For many of these errors there are legitimate excuses. We had to get started fast. It was impossible to plan calmly and deliberately. If a 100 percent perfect job had been done, it would have been a miracle.

On another point, however, little excuse exists. That is the relatively poor utilization of much of the existing machine tools in various metal-working industries producing war goods.

A considerable portion of the blame for this condition can be put on the doorstep of the prime contractor. Two cases come to mind. In the first instance, a contractor put in a request for several million dollars worth of new machine tools. Many of the tools sought are standard types. Evidently the contractor had made no attempt to find any used machines or to farm out the work.

In the second case, a company making a munitions item wanted a number of turret lathes and secured priority for them. Meanwhile the management found a shop to do the work on a subcontract. Now the new machines are ready and the company is seeking to shut off the subcontractor so that it can operate its new machines. It would be much more sensible to maintain the status quo and release the machines to points where they are badly needed.

Many, many examples can be cited which show that we are nowhere near full employment of our machine tool resources. Nor are we using what we have with the greatest degree of intelligence.

Not until we squeeze every ounce of energy out of every machine tool adaptable to war work 24 hours a day, and not until we put on the right job with the right tooling every machine tool turned out by the machine tool industry, can we be sure of victory in this Battle of Production.

Burnham Finney

GAGING BUSINESS

Machine tool builders will make 375,000 units this year. Rationing coming for new machines. Cut exports to Britain. Consumer goods make way for war. Wood, steel replace aluminum in planes.

Over 375,000 machine tools will be produced by U. S. machine tool builders during 1942. That is well in excess of 1,000 machines a day, 365 days out of the year. It is by far the largest volume ever turned out by the machine tool industry here or in any other country.

One reason why war production in this country is climbing sharply is that some 190,000 machine tools manufactured the past year have been put to work. A considerable number went to the British Empire and to Russia, it is true, but the great bulk of them were installed in U. S. factories making planes, guns, tanks and other munitions products.

Machine Tools—March has proved to be the biggest month on record for new orders for many machine tool companies and dealers. The explanation for this extraordinary spurt is simple. The 200 companies at the top of the machine tool preference rating list were told by War officials to put in their orders for necessary machine tools by April 1 or they would forfeit their preferential rating. As a matter of self-protection they rushed to comply with the suggestion.

The rationing of all new machine tools will be substituted shortly for the priority system which has been in effect on a compulsory basis for more than a year. Allocations will be instituted just as soon as the right machinery for handling them can be set up. It is believed that rationing will help eliminate the intense competition between government agencies for the available machine tools. It also will help each agency to plan better what it can expect to receive in machine tool equipment in the months ahead.

In the rush to get their orders onto the books of machine tool builders, many war contractors have bought tools with little advance knowledge of specific requirements. This helter-skelter method of buying is not the best way of purchasing, to say the least, and can only be excused on the grounds that this is an exceptional emergency, in many respects it imposes an unwarranted burden on the machine tool industry.

The percentage of machine tools to be shipped to England, based on total output by the machine tool builders here, has been further cut down. The flow of machine tools to Canada, however, continues with no slackening. Russia has been getting and will receive in the future a considerable number of U. S. machine tools. Nevertheless America's own war plants will get the big bulk of the domestic output.

Looking to a tightening situation ahead in the labor supply, some machine tool manufacturers are beginning to take on women factory workers for the first time. So far the industry has been seriously handicapped by lack of factory help, partly because builders have done a thorough job of training new men quickly.

The machine tool industry continues to lead all American war industries in the average number of hours worked per week.

Consumer Goods—Civilian goods manufacture is being halted soon in many lines, with all slated to get the axe. There are two reasons for stoppage—one is the scarcity of materials, the other is the need for rapid conversion to war production. The latter is what pushed the stoppage orders over the hump, for not long ago War Production Board officials thought that limited quantities of civilian goods would be produced to supply new houses constructed for war workers and to replace worn out appliances. But the need for more and more production of armament has made it imperative that all manufacturing facilities and skilled labor be converted *now*. Production has been ordered shut down on automobiles, washing machines, ironers, radios, phonographs and mechanical refrigerators. All other civilian items requiring scarce materials and/or manufactured by machines and workmen who can turn out armament will be stopped soon.

Aircraft—Wood and steel are rapidly replacing aluminum in many types of non-combatant aircraft. Curtiss-Wright will soon be manufacturing transports for the Army from Plywood and plastics. Much of the construction will be handled by furniture makers on subcontracts. North American Aviation saves about 1,250 pounds aluminum per plane by substitution with low carbon steel and plywood. Due to a shortage of forgings, one company is substituting castings where these are satisfactory. Engines which were one of the early bottlenecks in aircraft production are coming off the lines in adequate volume. Buick is so far ahead of schedule on bomber motors that it will produce in the first six months of this year what it expected to produce in the full year. By December the rate will be five times what the original schedule called for. Another General Motors division—Fisher Body—has expanded bomber manufacturing facilities and this month will turn out several times more parts and sections than in any previous period. To increase manufacture of P-47 pursuits (Thunderbolts), Republic Aviation has released the design to other aircraft concerns at the Government's request.

Shipbuilding—Soon the United States will be turning out ships at a rate greater than that of all the rest of the world combined. Liberty ships are being built in 17 yards with 165 ways—none of which existed before 1941. Up to March 15, keels for 142 Liberties had been laid, 61 had been launched and 22 were in service. A New Orleans shipbuilder has been given a contract for Liberties and will undertake an experiment in putting the vessels on a production line method of fabrication. If successful, it will be installed in other yards. Actual tonnage production per day in shipyards of the nation a little more than equal the rate of losses from Axis submarines. This is because they have been sinking smaller ships than we are building.

Steel—Steel production continued to climb upward in February and the first three months of March. According to the Federal Reserve Board it was 98 per at the end of last month. This corresponds to a yearly rate of 87,000,000 tons. The rise is due to an increase in scrap deliveries, and it appears now that this year's output will not be lower than last year's as many authorities were predicting a few weeks ago. But production will not be at maximum, for the steel mills could use more scrap than they are getting.

Munitions—Since January prime contracts and subcontracts reported by the Army Ordnance districts have been doubled compared with previous defense and war contracts. To keep a closer watch on the production front, Nelson is requiring a selected list of firms to submit a monthly report showing just how far they are getting. The report, which is compulsory, covers data on deliveries and production rate—broken down among high-priority, low-priority and civilian work. Man-hours and machine hours worked together with detailed information on shifts are included. Mr. Nelson also asks for an estimate of when the company will reach peak production. Machines which can take on additional work can be listed.

Steel Plate—Shipments of steel plate are at record rates, with total March billings estimated at over 800,000 tons. This still isn't too much for the expanded victory program. Users of plate have been asked to comply with a series of specifications in ordering plate, a series designed to maintain maximum production in the plate and strip mills.

GOVERNMENT WORKS TO STABILIZE WAGE RATES

WPB Organizes Unit to Find, 'Mine' Scrap Metal Sources

WASHINGTON—Because the collection of scrap metal, still critically short, is becoming a major enterprise, even in these days of Bunyonesque missions, the War Production Board has organized a Special Projects Salvage Section of the Bureau of Industrial Conservation. J. Widman Bertch is chief SPSS.

It takes imagination to find all the scrap sources, and it takes ability to mine them. Some sources are tied up by uncertain ownership, inaccessibility to transportation and high cost of demolition. These include abandoned mines, sunken ships, condemned bridges, dry oil wells and old machinery.

One source alone: abandoned street car tracks, will produce about 300,000 tons of steel. Where the cost of demolition is too high for dealers the government will take over. Scrap must be obtained in such quantities that cost is no object. Willful non-cooperation will call for WPB to seize property.

The Salvage Section will have offices in New York, Boston, Pittsburgh, Buffalo, Dallas, Philadelphia, Baltimore, Cincinnati, Butte, Cleveland, Detroit, Chicago, Atlanta, Memphis, Seattle, Salt Lake, San Francisco, Los Angeles, Denver, St. Louis and Minneapolis.

Paul C. Cabot, deputy chief of the WPB Conservation Bureau, says that Washington press agents have failed to impress the public with the importance of scrap metal collection.

LIMITS PLATE SHIPMENTS

WASHINGTON—The War Production Board has just taken its first restrictive action under the steel plate allocation order M-21-c. By telegraph over a weekend, the Division of Industry Operations instructed plate suppliers to make no more shipments, except for locomotive boilers and fire boxes, to the Pennsylvania Railroad, New York Central Railroad, and Louisville and Nashville Railroad.

First filing of a new inventory showed that Pennsylvania had on inventory about seven times reported average monthly use; Louisville, more than 13 times average monthly use; and New York Central, seven times average monthly use. It would be impossible for the Board to lay down a flat rule on inventory, but in general, three months' supply is regarded as sufficient.

ORDER 427 ELECTRIC TRUCKS

CHICAGO — Electric industrial truck orders totalled 427 units in February, according to the Industrial Truck Statistical Association. Total value was $1,495,730 compared with $1,262,812 in January. Included in February bookings were 51 non-elevating platform trucks, 345 cantilever trucks, 17 light and heavy duty tractors, 13 crane trucks and one special truck.

Rolling to the Battle Front—A train load of M-3 medium tanks on their way to the front lines. Tank production in U. S. factories is speeding ahead rapidly. Soon the M-3 will be completely superseded by the better designed M-4

Double time forfeiture blocks Smith Bill, but Unions' demands must not hinder production

By ROBERT COLBORN

WASHINGTON—The AFL-CIO agreement to waive payment of double time for work on Sundays and of time and a half for work on Saturdays—both of them widely accepted in union contracts—will help solve an annoying problem arising from seven-day operation of plants. But it is no more than a token approach to the underlying labor issues now agitating the capital. Most plants working a full week only work their men six days each. But some shifts overlap the weekend, and traditional penalty rates for Sunday work have made shift-scheduling difficult.

Prime immediate purpose of the agreement, however, is to head off a new Congressional push for restrictive labor legislation—a push exemplified in the latest version of the perennial Smith bill. This bill would forbid payment of overtime rates after forty hours, would freeze the status of the closed shop, would limit profits on war contracts. Administration and War Production Board both opposed such legislative action. Donald Nelson told Congress the Smith Bill would hinder production, and also took occasion to lay a groundwork for the AFL-CIO agreement by emphasizing the iniquity of Sunday rates.

Elimination Means Higher Rates

There seems little doubt that once again the administration will be able to prevent Congressional action on labor. But this does not mean that the President intends that the unions go their own sweet way. Roosevelt has little sympathy with the objectives of the Smith Bill. He and Nelson see overtime pay as a valuable incentive. He doesn't want to put through what would amount to a wage cut by eliminating it. As a matter of fact, many industrialists fear that elimination of overtime would result in immediate demands for higher hourly rates and realize that while overtime pay stops when the overtime stops, hourly rates tend to persist.

Nor is there any feeling in the administration that the closed shop either interferes with war production or contributes to inflation. Whatever the post-war effects of extension of the closed shop, officials whose main preoccupation is the war would regard it as a cheap concession to make to labor in return for what they really want from the unions.

Favors Overall Stabilization

And what they really want is stabilization of basic hourly wage rates. Overtime pay can only increase so far, but

constant increases in wage rates can lead to an inflationary spiral.

Roosevelt still hopes he can achieve wage stabilization by voluntary agreement. But so far there are few signs that he is prepared to go all out to get it. In one respect, the Sunday work concession indicates progress toward a wage agreement. It marks the first retreat by the CIO from its contention that wages and working conditions cannot properly be the subject of national agreements, that they must be solved case by case in collective bargaining.

FDR Seeks Labor Policy Bid

Ever since he obtained the no-strike agreement, the President has been trying to get the AFL-CIO joint committee to go along on an over-all statement of labor policy—something which would guide the War Labor Board in its individual decisions. The AFL has been willing, but CIO has resisted. Maybe an opening has been made.

If Roosevelt can get a wage agreement and if the strike record continues as good as it is now, legislation can be staved off indefinitely. If not, there will be a law. Not a law on the Smith pattern, but a law freezing wages or at least putting them under control of the Price Administration.

WILL PROTECT PLANTS

WASHINGTON — Committees representing Army, Navy and the Office of Civilian Defense soon will be established in the nine OCD regions to assist local authorities in identifying Army and Navy plants for special protection.

OCD's responsibility includes issuance of instructional matter on air raid protection for industrial plants, offer of opportunity for Army, Navy inspectors to attend meetings, and provision of local assistance.

Army and Navy are not willing to send lists of their contracting plants to municipalities. Therefore, to receive the necessary special assistance, the plants must be identified to local authorities. War contractors are not required to participate in local air raid protection against their will.

ESTABLISH SHIPBUILDING OFFICES

WASHINGTON—To step up the vast merchant shipbuilding schedule, the Maritime Commission is setting up four complete regional offices with full responsibility for construction of merchant vessels. These four offices will be in San Francisco, New Orleans, Chicago, and Baltimore. Locations are selected because of their convenience to the shipbuilding areas of the country. About 200 employees of the planning and technical divisions of the Commission started moving out of Washington to the new centers April 1. Carl W. Flesher will direct the west coast office; L. R. Sanford, the Gulf area; J. F. McInnis, the east coast; and W. E. Spoffard, the Great Lakes.

Higgins Plan to Build Liberty Ships on Production Line Basis Gets Maritime Commission Test

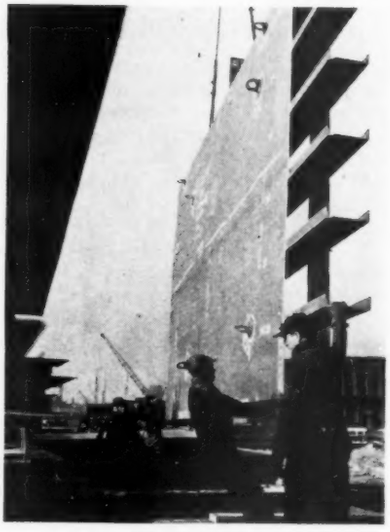
WASHINGTON—Systematic prefabrication and distribution of parts to Liberty ship ways has been described recently as "assembly line" practice. Of course it isn't the real thing. But a man named Andrew J. Higgins, of New Orleans, has a plan that comes close to putting ships on a production line basis, and the Maritime Commission is so impressed it has given him a contract to build his yard and turn out 200 Liberties by the end of 1943.

If Mr. Higgins can do that, he probably will have revolutionized mass shipbuilding, and he will have landed a strong punch on the Axis chin. Higgins is the inventor and builder of troop-landing speed boats that skip out on dry land, and several kinds of Navy torpedo and other combat boats.

Details Unrevealed

The Higgins yard will be devised to take advantage of the skill and speed acquired by men and crews who do the same thing over and over. That is the essential thing in real production lines. Of course the ships cannot be on a moving way, and probably they will not even be lined up on one way. The Commission will say nothing about the system now; by keeping silent it can gain several months before the enemy catches on. When the yard has progressed to such a point that anybody who comes near it can see how it works, then the Commission will publicize the details. Parts will come to the Higgins yard from sub-contractors all over the country, as they do already to yards on all three coasts assembling Liberty ships.

Prefabrication — To speed construction of Liberty ships, whole sections are prefabricated before being shipped to the shipyard. Top plates are being welded to angle frames (above). Completed sections are carried six miles to the ways on flat cars. Flow of parts is maintained at rate of ship construction so that yard inventories are kept low



Large prefabricated section for a Liberty ship is being hoisted into position at ship way

At the same time the 200 ship award went to Higgins, the Commission awarded 34 Liberty ships to W. A. Bechtel Co., San Francisco. Nothing is said about the Higgins system being used by other yards, but you can assume it will be—if and as soon as it proves up to expectations.

As AMERICAN MACHINIST predicted, the Commission has stepped up its 18,000,000-ton program to 20,000,000 tons for 1942-1943—making a projected two-year schedule of nearly 2,000 ships, including Liberties, the C series, tankers, and other designs.

The over-all ship program is 2,877; 157 of these were delivered before March 1; 750 will be put in service this year; and 1,000 or more will be commissioned in 1943.

Land Criticizes Slowness

Chairman Emory S. Land of the Commission is reported to have told a closed committee session in congress that it will be extremely difficult to meet the President's 1942-43 ship schedule. He said, according to reports, that shortages of materials and trained workers are impeding the effort to reach a rate of three ships a day by the year end. Admiral Land complained not so much of strikes as of a dilatory attitude by both labor and management.

He is quoted as saying that the difference in production between different yards is alarming. The Axis had sunk about 50 ships between mid-January and March 23—a period of about 65 days. The present rate of construction is one a day. Unit sinkings look much worse than the tonnage figures, however; many of the lost ships are small.

Canadians Find Themselves More Efficient, Lose Complex

OTTAWA—One effect of U. S.-Canada war production integration is to free Canadian industry from some of its habitual inferiority complex in relation to U. S. industry.

Illustration: Two big companies, one in the U. S. and the other in Canada (a wholly Canadian Company) have identical war production contracts. The Canadian company, thinking it could learn something from its opposite number below the border, recently sent two of its experts to the U. S. plant. They expected to be there two weeks getting efficiency pointers. After four days they came home because they found there was nothing for them to learn that they didn't know and much the U. S. company could learn from the previous experience of the Canadian firm. As a result, the tables are turned and the big U. S. company is sending men to the Canadian plant to pick up ideas.

Differences: Both plants have work forces of about the same size—around 6,000 people. The U. S. firm has an overhead office staff of about 1,500 doing work that is done in the Canadian plant by a staff of under 450. The Canadian experts figure their unit costs will be $10,000 under the costs for the U. S. plant.

To add to the comparison, a U. S. expert who recently looked over the Canadian scene came to the conclusion that with the exception of one operation the work of this particular company was more efficient.

Financial Aid, Contract Pool Will Assist Small Business Get Into War Production

WASHINGTON—For the first time there appears a prospect that small manufacturing businesses, or small businesses capable of becoming manufacturing business, will be drawn into the war production job on a large scale. Despite all the talk of the last couple of years, two major obstacles have stood in the way. First, the small business problem has been a relief problem, a way of helping poor devils that had been forced out by material shortages. And war just isn't a relief program.

Second is the fact that the War Production Board and its predecessors, where there has been a certain amount of recognition of the problem, have not had the machinery really to do anything about it. The old Division of Contract Distribution could draw up all the programs it wanted to, but when it came to the actual award of contracts, War and Navy had the say.

The relief attitude is gradually changing in favor of a belief that the production of small shops is actually needed. Testimony on the small business bill now romping through Congress emphasized that in Germany small producers are forced to take contracts; it's a duty not a privilege.

Would Make Loans

The bill, sponsored by Senator Murray's Committee on Small Business sets up a $100,000,000 corporation attached to the War Production Board. This corporation would be empowered to take contracts from the Army and Navy and subcontract them out. Moreover, it could make loans to small business men to finance conversion and provide capital.

For the first time this will provide War Production Board with a pool of orders which it can place with contractors in whom the Army and Navy are not interested. And it does this while still, technically, leaving the contracting power in the services.

In a somewhat similar move, the War Department itself is now getting ready to guarantee bank loans obtained by munitions subcontractors—thus opening the door of war business to firms whose factories may be good though their credit rating is low.

In fact President Roosevelt, in an executive order as we went to press, directed the Army, Navy and U. S. Maritime Commission to make or guarantee loans to provide working capital for munitions contractors and subcontractors.

The small business got a boost last month, too, when Nelson eliminated competitive bidding from munitions buying (*AM*—Vol. 86, p. 184c). Now the small firm doesn't necessarily have to meet the prices of a big one. Subcontracting is favored, too, by a clause in the Nelson directive requiring that preference be given to contractors who already have the needed machines—and permits them to count machines owned by prospective subcontractors.

British-Combine

England Makes 'Em Underground—Many of England's war factories have been moved underground to take them out of reach of Nazi bombs. This former chalk mine has been converted into an aircraft factory. Up to the minute record of production of thousands of parts is kept in the control room (left). Girls get reports direct from each department via telephone, make immediate changes on charts and graphs. Fluorescent lighting and air conditioning have been installed to permit work in the shops hewn out in the tunnels of the old chalk mine. Women operate drill presses (center) and many other machine tools. At lunch time, workers walk up one of the exit ramps (right) to canteens on the surface. All other departments and offices are in the tunnels below ground

R. T. Wise Appointment Signalizes Expansion Of Canadian Cutting Tool, Gage Production

OTTAWA—Roy T. Wise, United States authority on cutting tools and gages, who has been on loan to the Government of Canada from his peacetime post of consulting engineer to Union Twist Drill Co. has just been named director-general of cutting tool and gage production in the Canadian Department of Munitions and Supply. He retains the post of deputy controller of machine tools which he has held since coming to Canada.

Munitions Minister C. D. Howe's advancement of Wise to the top job in the new division of cutting tool and gage production signals a program of expansion in such production in Canada. This country has depended for the great bulk of its war requirements in machine tools on the United States. Before the war nearly all the machine tools used in Canada were imported from the U. S. and Great Britain. Consequently the Dominion was not equipped to supply any considerable part of its own needs when war came.

R. T. WISE

War Cuts Imports

Although U. S. supplies of such equipment have been freely available to Canada, there has been a constant shortage throughout the war and this was aggravated when the U. S., entering the war, launched its production expansion program. Since the start of the war Canadian shops have been slowly but steadily increasing their output of tools but the country is very far from being self-sustaining in this line. Under Wise's direction the manufacture of cutting tools and gages will be expanded and speeded up.

When the war started only five Canadian shops were making gages; now 85 shops are in production. Since September, 1939, Howe's department has placed orders for 155,000 gages representing an expenditure of $4,500,000.

The Dominion's big and successful gun-making industry, developed virtually from scratch since the war started, has learned to make many of its own machine tools. This has been a notable feature of the John Inglis Co. which is one of the most successful of Canadian war equipment producers. But machine tools continue to constitute an overholding bottleneck on the country's war industry. For a long time Canada will have to look to the U. S. for most of its machine tool needs.

Use U. S. Designs

With the trans-border coordination of war production U. S. designs are being followed almost entirely in Canadian manufacture of tools. For some time a special effort has been made to supply specific purpose tools for special jobs in order to release as many as possible of the available general purpose machines.

Howe's department has more than a suspicion of the existence of a considerable transborder traffic in machine tools and gages by profiteers and is now investigating before instituting a crackdown. Some Canadian traders are said to be buying up tool units in the U. S. wherever they can be found and peddling them in Canada at prices which give them up to 40 percent profit.

Ottawa has followed Washington's lead in making the use of scarce materials for purposes other than those for which they were supplied a criminal offense, with penalties up to a fine of $5,000 and five years imprisonment.

Draw Women for War Work

Features of Canada's new manpower plan which bear most directly on industry are: (1) establishment of a large class of restricted occupations covering most non-war employment for which employers are barred from hiring men between the ages of 17 and 45; (2) an order making it compulsory for employers to release skilled employees for essential work when the Labor Minister requests their transfer from non-essential employment; (3) making of an inventory of the country's manpower as the basis for the transfer from non-essential to essential employment; (4) provision for attracting women into industry to make up about half the 100,000 extra workers required this year.

Agricultural workers are frozen to their present employment. The new manpower plan has been placed under the direction of Elliott M. Little of Anglo-Canadian Pulp and Paper Co. For the present compulsion in drafting men and women for war service does not extend beyond the limits indicated but the Government has warned that this is only because of the amount of organization machinery required to establish universal compulsory service and that the shift to compulsion will be made in line with the entire plan.

WPB Places All Companies With "P" Ratings Under PRP

WASHINGTON—Purp is top dog. The War Production Board has officially decided that most industries and companies which have been operating under blanket "P" ratings will be changed over to the Production Requirements Plan—PuRP. This is a process which, actually, has been going on for a month now (*AM*, Vol. 86, p. 248c). Over the next three months nearly all the open-ended P orders, which simply grant a rating to an industry for any quantity of goods it wants to buy, will be replaced by PRP. Under this plan, a company gets a rating or ratings covering purchases during a calendar quarter of specific quantities of goods.

As previously pointed out by AMERICAN MACHINIST this is a long step toward allocation. The elaborate PD-25 application form used under PRP provides just the information needed to give the complete picture of the flow of materials through industry which real allocation requires. With nearly all industry forced onto PRP, the information will become quite full.

Check on Allocation

As compared with full allocation, however, PRP has the saving grace that it is a combination of allocation and priority rating. When PRP is working perfectly, the quantity allocated is all that really matters, but if initial mistakes are made and there isn't enough material to fill all the PRP orders, then the priority ratings tell which PRP orders to fill.

Use of the Production Requirements Plan has been considerably simplified by permitting firms to extend the ratings on orders they receive for goods, manufacture of which requires purchase of materials of a sort not regularly carried in stock. Previously, PRP users were forbidden to use any other ratings, and receipt of such an order would require submission of an amended PD-25 application, which is a laborious job.

CANADA FORMS METALS CORP.

OTTAWA—Responsibility for supervising Canadian production of metallic magnesium and other emergency projects that may be undertaken for the production of scarce war metals, has been vested in the Wartime Metals Corporation, a recently formed government owned company. Between $5,000,000 and $6,000,000 will be spent on a project near Renfrew, Ontario, for a plant using a new thermal method for producing metallic magnesium from dolomite. By mid-summer actual production is expected to begin at the rate of two tons of metal per day. As additional units are built this rate will be stepped up to ten tons per day, and some time next year production will reach a rate of 20 tons per day.

INSIDE DETROIT

Wilson voices auto industry skepticism of labor-management committees advocated by WPB production drive. Military vehicle makers unite in first council subdivision. Curb inventory sales

BY RUPERT LEGRAND, DETROIT EDITOR

DETROIT—It is questionable whether much good will come out of the joint management-labor conference held under auspices of the War Production Board to promote Donald Nelson's production drive. James Adams, Nelson's delegate to handle the Detroit show, stage-managed the conference neatly, despite the lukewarmness of industry to a program of "dangerous generalities."

It was made clear from the platform that joint management-labor committees are suggested to act purely in an advisory status to promote efficiency and build morale. Yet during the question period, labor representatives, such as local-union officials and shop stewards, repeatedly confused the purpose of the committees with a vehicle to argue collective bargaining matters.

Gives Industry View

From the floor a local-union president asked if the industry was prepared to give labor an "equal" voice in management of war production through these committees. C. E. Wilson, General Motors President, replied for the industry as follows:

"Any committee of this type can only be a suggesting and advisory committee to management. If it were a General Motors committee without any labor representatives it could still be only an advisory set-up to the management. A joint committee made up in various kinds of ways could never have an 'equal voice'. Who is going to be responsible for it? . . . It bothers me personally that every time we get a job to be done that we get a bunch of committees, but, by God, we can't do it that way in our country."

"Now these committees can be helpful and representatives of the management and the men may be a clearing house to get suggestions considered. But so far as the 'equal voice' bunk—No."

Dislike Committees

Automotive men with wide backgrounds of production and managerial experience agree with Mr. Wilson in disliking a program calling for another committee. They know that committees never can run anything, and in the case of the advisory committee they point to the fact that it is supposed to dig into matters that management in any well-run enterprise has been on top of for years.

Take Point No. 3 in the plan, which calls upon the committee to "arrange for a study of plant efficiency." Attention is to be given to such matters as care of tools, preventing breakdowns, reducing accidents, minimizing waste, good lighting, maintenance and repair, breaking production bottlenecks, using every machine to the fullest extent. Whoever wrote the plan may not have been familiar with the fact that capable supervision has specialists working on these matters constantly, and has long followed the practice of using suggestion boxes except when frowned upon by unions.

Managements Disagree

The WPB asks, not directs, that joint advisory committees be established largely on the premise that labor "participation" will help build morale. Various views are held in the auto industry on the necessity for morale-building campaigns. Packard and Oldsmobile outlined at the Detroit session elaborate campaigns intended to awaken working forces to the importance of their assignments. On the other hand, a plant that is building aircraft material well ahead of schedule finds that its people are fully awake to the need for meeting production quotas because the draft and casualties strike close to home.

The goal of a 25 percent increase in production is considered another vague generalization, or slogan. Union leaders present at the Detroit meeting pledged that labor will give 60 minutes of work per hour, although they decried a "speedup" for workers, saying that full utilization of machines is the proper method of achieving Nelson's goal.

Some extra production can be squeezed out from full cooperation by labor, say fifteen percent, according to one well-known executive. Even with a good incentive system the average worker with normal effort will achieve about fifteen percent more production than time standards. If a 25 percent gain is achieved, it may result from improperly set tasks.

PRP Will Assist

Automotive forge shops engaged on munitions work have finished tooling required for munitions work but cannot get bars. Fortunately the priorities system is giving way to distribution of scarce materials under the Production Requirements Plan. Between April 1 and June 30 most of current blanket rating orders will be allowed to expire or be revoked, and companies will be required to apply for priority assistance under the Plan, the application covering all of estimated materials for a three-months period.

All manufacturers of motor trucks, buses and trailers have been joined together in a Military Vehicles Division of the Automotive Council for War Production, under the chairmanship of Irving B. Babcock, president of Yellow Truck & Coach. This step marks the

EMPLOYEES INCOME RISES

DETROIT—Average annual earnings of regular hourly rate employees of General Motors Corp., including those who had intermittent employment, increased to $2,141 in 1941, from $1,804 in 1940 and $1,503 in 1939. The increase from 1939 to 1941 amounts to 42 percent, while average hours worked per week increased 4 percent from 39.1 in 1940 to 40.7 in 1941.

Adaption — Two months after signing the contract, Fisher Body turned out its first vertical boring mill (right). Skilled auto body craftsmen and their equipment were adapted to manufacture 100- and 112-in. boring mills at government request. Other machine tools being turned out by Fisher are large planers

first product sub-division to be established by the council. The new division will put into action a program dealing with the problems of production, engineering, parts output, distribution and interchange of technical information and facilities.

Beating Schedules

Although the industry has been ahead of schedule in production of military vehicles, differences between them and commercial types created production problems in certain types of combat units. The division of the council is pledged to unlimited support and aid to all plants in the industry to get out production of war material in the face of shortage of materials and fabricating facilities in the months ahead.

At mid-month the War Production Board extended the ban on "bright work" for all types of motor vehicles and trailers, replacement parts and accessories, and placed rigid restrictions on disposal of remaining inventories. Although stockpiling of replacement parts for passenger cars and light trucks is supposed to end by June 30, a large part of the program will be wound up by mid-May.

Studebaker Stops Process

With the end of automobile production, Studebaker discontinued silver plating on interior and exterior trim, a process that was instituted to save chromium and nickel on late 1942 cars. The steel pieces were given a special type of bonderize coating, and the silver deposited on the treated surface. The silver was put on in two strike baths of special current densities followed by a special silver plating bath.

Exterior parts were given protection against tarnishing by indium plating after applying a Butler finish to the silver plate. The indium was alloyed with the silver by baking in a still atmosphere for two hours at 350 F. After polishing to a Butler finish, the indium alloy was further protected with two coats of clear synthetic enamel.

CANNISTER REPLACES SHRAPNEL

WASHINGTON—Ordnance has junked shrapnel, invented in 1784, and has standardized cannister shot instead. No more shrapnel will be manufactured. Shrapnel is a projectile loaded with a base charge of explosive and a quantity of ball. A fuse is set in the projectile before it is fired from the gun, usually a field gun. At a predetermined elevation over the target, the charge in the projectile explodes, discharging the shrapnel from the muzzle.

Cannister, as the name implies, is a can full of ball, specifically 122 balls ⅜" in diameter. There is no explosive in the can. As soon as the can leaves the muzzle of the gun, it disintegrates, and the balls continue, exactly like a charge of shot from a shotgun. Cannister is used in field and tank guns, mostly for dislodging machine gun nests.

Otto Winter Becomes A.S.T.E. President, Select Potter For Executive Secretary

ST. LOUIS—Otto W. Winter, vice-president, Republic Drill & Tool Co., was elected president of The American Society of Tool Engineers last week at the society's annual meeting here. Ray H. Morris, vice-president, Hardinge Bros., was elected first vice-president, with D. D. Burnside, superintendent, American Stove Co., selected as second vice-president.

Other officers named at the meeting were: Secretary, Clyde L. Hause, sales engineer of Gorham Tool Co.; and treasurer Frank R. Crone, chief tool designer of Lincoln Motor Co. Both were re-elected. Springfield, Mass., was selected for the semi-annual meeting on Oct. 15, 16 and 17. Next year's annual meeting will be held in Milwaukee.

Adrian L. Potter, for sixteen years secretary, Convention Bureau of Springfield, was appointed executive secretary of the society succeeding the late Ford R. Lamb. Mr. Potter's headquarters will be in Detroit.

E. V. Larson, assistant deputy machine tools controller, Canadian Department of Munitions and Supply, attended the meeting to aid delegates who are having difficulties supplying Canadian plants.

O. W. WINTER

Dr. Charles Copeland Smith spoke on "Engineering for Victory" at the annual dinner.

WAR ORDERS IN BRIEF

FARM MACHINERY—Manufacturers of farm machinery and equipment covered by Limitation Order L-26 are subject to the order's terms regardless of whether they can obtain materials without use of a preference rating.

FURNITURE — Limitation Order L-62 bans production of metal household furniture after May 31. Use of metals in such items until then has been sharply reduced.

LAUNDRY EQUIPMENT—Supplementary Limitation Order L-6-c directs companies producing more than 60,000 units of domestic laundry equipment last year to stop production April 15, while producers of less than 60,000 units must halt operations May 15.

MOLYBDENUM—Preference Rating Order M-110 places molybdenum under complete allocation control.

OFFICE EQUIPMENT—Durable office equipment cannot be ordered with preference ratings assigned by Preference Rating Order P-100. Limitation Order L-54-b halts purchase sale and rental of new office machinery except on A-9 or higher preference ratings issued on PD-1-a or PD-3-a certificates.

PHONOGRAPHS—Limitation Order L-21-a stops production of automatic phonographs, weighing and amusement machines on May. 1. Manufacturers may produce from "present inventory" three times their February quota between March 1 and April 30.

PLASTERING BASES—Limitation Order L-59 reduces metal consumption of large producers of metal plastering bases and accessories by 50 percent and of little producers by 25 percent.

PLUMBING SUPPLIES—Schedule V to Limitation Order L-42 orders simplification of plumbing fixtures and trim.

SHOE MACHINERY—Manufacture of shoe and other leather processing machinery is being halted except on A-9 or higher preference ratings.

STEEL PLATES—Consumers of steel plates are asked to conform to a list of requirements in placing orders so that maximum production can be maintained in continuous strip mills.

TIN—Conservation Order M-43-a directs that Army, Navy and other governmental agencies conform to a list of special restrictions on the use of tin.

TYPEWRITERS—Limitation Order L-54-a curtails production to meet only essential requirements and controls distribution of all new machines.

VENDING MACHINES — Supplementary Limitation Order L-27-a stops production of vending machines after April 30.

WELDING—Preference Rating Order P-39, assigning an A-1-c rating to deliveries of material for arc and resistance welding machines, has been extended to May 1.

WARTIME WASHINGTON

Some government, industry heads in conflict over who is boss of war production. But Nelson has all powers. Labor-management units experiment in keeping momentum. Will allocate labor soon

BY BLAINE STUBBLEFIELD

WASHINGTON—There is quiet along the Potomac on the question: Who is boss of war production? But enough ambitious hearts are burning to cause a scuffle now and then.

Donald Nelson's memorandum to officers and employees of the Army Services of Supply and the Materiel Command of the Air Forces appears to be purely informative. But any persons inclined to feel that the Army or Navy has the last word, could easily consider themselves told otherwise.

"Although the immediate responsibility, initiative, and decision for a particular function is placed in one part of the organization (meaning the war supply *system*) the assistance of the other parts is expected and directed."

In Congress the other day, Undersecretary of War Patterson said that although the War Production Board has been granted supervisory powers over contracting for war material, the prime responsibility still remained with Army and Navy procurement agencies. He said that these agencies are well acquainted with the capabilities of industries, and that final responsibility for contract allocation must stay in the War Department. Senator Taft spoke up with the reminder that the general public, and Nelson himself, believe that the prime responsibility rests with WPB. Patterson later explained that WPB is in sole responsible charge of the over-all program, and can exercise veto powers over Army procurement plans. He didn't say so, but he would have included the Navy too.

Nelson's Authority Proper

This exchange is reported because it seems to illustrate conflicts in the minds of some officials in both government and industry.

The War Production Board is the top boss, and the Board is really Mr. Nelson. Nelson's power is made plain beyond any doubt in the President's directive creating WPB.

It is entirely proper under the Constitution that the supreme war power be in civilian rather than military hands.

Mr. Patterson of course understands the relationship between the War Department and WPB. Whether he resents it or not this writer does not pretend to know. What Mr. Patterson concluded was that the Army and Navy and the other procurement agencies have long experience in their own requirements, and in the business of getting industry to meet those requirements, and that this experience should be made use of.

And it *is* being usesd. All the procurement agencies of the Army, plus services, like the Engineers and the Medical Corps, have been grouped in the Services of Supply, and all are functioning just as they always did—many of them under the same officers. The only exception is the Materiel Command of the Air Force, which still buys its own airplanes and some other equipment. This is considered so highly specialized that the users should be the procurers for a while yet.

Seeks Re-acceleration of Drive

Bombs on Pearl Harbor brought a burst of energy into American factories. December and January production of war goods zoomed to new heights. But the effect is wearing off now; gains are being held, but the zip has gone out of the indices. It is in a desparate effort to re-capture some of that first push that Donald Nelson has launched his great promotion and propaganda campaign in the factories—taking the not inconsiderable risk of a dismal flop.

Being launched initially in some 50 selected plants, the scheme requires that a committee of management and labor start a blitzkreig of posters, stickers, slogan contests and general hoopla to whip up the spirit of the workers.

A tricky point has arisen in the more or less accidental choice of "management-labor committees" to run the Production Drive. CIO has been calling for months for creation of such committees. But President Murray of CIO wanted the committees to help run the plants. Nelson wants them to help run the workmen, which is a lot different. CIO has started a definite campaign to use the Nelson plan as a means of putting into effect the Murray plan.

Labor Allocation Developing

Labor allocation—routing of manpower to the war industries—the next in the series of drastic controls which have been imposed on American life—will be on a par with priorities and the draft. It won't come all at once. Though the need is already beginning to be felt, real up-against-it labor shortages aren't anticipated until late fall or next year. But the first steps are now being taken: the registration of men over military age, the circulation of occupational experience questionnaires to men who have been exempted from the draft.

Initial moves will probably be made through the draft machinery. Idea being studied is to combine the dependency and essential-work exemptions from the draft, to require that a man have both dependents and an essential job to get permanent exemption. Then, if labor shortages show up somewhere, draft boards can locate men with the needed skills through the occupational questionnaire, can warn them that if they don't want to go in the Army, they'd better change jobs.

Although a formal system of allocating to jobs could probably be based upon the existing draft law, its certain that no such tricky approach will be tried. Legislation has already been introduced, but for the present it's not an administration measure. But before the year is out Congress will be asked to act on some such law as the one England has empowering the government to tell anyone to work anywhere.

NYA Tools Unusable

In response to newspaper charges that a large number of metal-working tools are standing idle in scattered National Youth Administration training centers, the War Production Board last week issued a summary of the facts.

Tools committees of WPB and the Army and Navy Munitions Board recently ordered personal inspection of NYA tool inventory by Army and Navy

Inspection—Lt. Gen. William S. Knudsen with Theodore Trecker, president of Kearney & Trecker, on a recent visit of the Army production chief to the K. & T. plant at Milwaukee. The company is in the midst of constructing a large addition to its manufacturing plant

Tests — Women seeking employment in Canada's war plants undergo a series of aptitude tests. In test at right squares are fitted into their proper squares, while at left applicant draws object which she sees in mirror

district ordnance officers. This inspection was in addition to inventory lists compiled by NYA itself. The inspectors examined thousands of tools, WPB says.

Very few tools of types critical in war production were discovered. These are being surveyed as to availability. Lists of available equipment will be distributed among field offices of Army, Navy, and WPB, and the available used tools section of WPB will endeavor to deliver the tools to any manufacturer who can use them.

Meanwhile, war contractors are advised to search their areas for used tools. In this they can get help from the available used tools section of the War Production Board, which has a comprehensive file of items and their location.

The Board's statement says that only 139 preference ratings have been assigned to applications by NYA for new tools. Nine were A-8, nine A-10 and one was A-7, the rest low.

War Board Names Advisors On Machine Tool Industry

WASHINGTON—Ten executives of the machine tool industry last week were appointed members of The Machine Tools Industry Advisory Committee for the War Production Board. They are: H. S. Beale, general manager, C. B. Cottrell Co.; A. G. Bryant, sales manager, Cleereman Machine Tool Co.; Ralph W. Burk, general sales manager, Kearney & Trecker Corp.; Ralph E. Flanders, president, Jones & Lamson Machine Company.

Also, A. H. Ingle, president, Consolidated Machine Tool Corp.; R. F. Ingram, secretary and sales manager, Landis Tool Co.; George H. Johnson, president, Gisholt Machine Co.; J. F. Miller, Ex-Cell-O Corp.; T. S. Ross, president, Rivett Lathe & Grinder, Inc.; D. N. Macconel, Machinery Manufacturing Co.; W. W. Tangeman, vice-president, Cincinnati Milling Machine Company; and R. J. Whiting, works manager, Hydraulic Press Manufacturing Company.

Speed Freight Car Output By Standardizing Designs

WASHINGTON—To hurry up production of freight cars, the Transportation Equipment Branch of the War Production Board has asked all car builders to standardize and pool their designs of box, hopper, gondola and flat cars. Standardization of height, width and length will eliminate much of the waste time required by manufacturers to shift from one design to another, and will reduce the number of sizes and shapes to be rolled by steel mills. Car builders are asked to exchange drawings.

The Director of Industry Operations, WPB, has ordered that railroad requirements for 36,000 freight cars and 1,260,000 tons of heavy rail in 1942 be filled. The Iron and Steel Branch has been instructed to continue schedules of steel shapes, sheets, bars and rails until the Supply Priorities and Allocation Board authorization of Jan. 1 has been filled.

Meanwhile, engineers of the Association of American Railroads are working on the design of a box car mostly wood above the sills. It would be so designed that after the war it could be converted back to steel in the course of maintenance. This objective would require that the wood sidewalls be mere curtains rather than loadbearing members.

But the prospect for steel saving is not very exciting because this type of sheet is not very scarce, and the additional steel required to strengthen frame and trucks of a wood car may nearly offset the steel saving in the box. Nevertheless, it may be decided that the wood substitution is worth going ahead with.

NORTON WINS NAVY "E"

WORCESTER—The Norton Co. last week received its Navy "E" products in recognition of production achievement on Navy contracts. The presentation was made by Admiral Wat Tyler Cluverius to Company President George N. Jeppson.

Steel Saves Much Aluminum In Making Training Planes

WASHINGTON—Again steel is proposed to substitute for bottleneck aluminum in airplane construction. North American Aviation is putting into production a combination of low carbon alloy steel and plywood to replace by weight 75 per cent of the aluminum in its training planes.

The wood will replace 250 pounds of aluminum and the steel 1,000 pounds, a total of 1,250 pounds of aluminum per plane. The saving in 1,000 AT-6A trainers would build 420 pursuit ships, the company says, or 150 medium bombers.

Steel aircraft construction is not new. Fleetwings, Inc., has built successful stainless steel airplanes, and Reconstruction Finance Corporation's Defense Supplies Corporation has a steel cargo ship in process of design to replace German equipment on South American airlines.

Habit Kept Aluminum

The obvious question—if steel is as good as aluminum for planes why hasn't it been used before?—it not easy to answer. AMERICAN MACHINIST asked four or five good aeronautical engineers, and all have stumbled on it, except to agree in general that designers have the aluminum habit and are set in their ways.

North American says the trainer design in wood and steel will increase the weight about 3 per cent or 150 pounds. But the engineers are confident they can improve the steel alloy to par by weight with aluminum. In making adaptations to steel, which is stronger than aluminum by volume, the designers will tend to reduce the weight.

Structural tests have indicated that these parts of the trainer can be built nearly or entirely of steel: wings, wing center section, wing tips, vertical stabilizers, rudders, elevators, flaps, and ailerons.

Use More Welding

The Company believes that equivalent substitution of steel will be practical in combat as well as training airplanes. If so, the change will affect the war program importantly. Steel is tight, but civilians are still using huge quantities which can be taken away from them.

It is easy to spotweld steel wing and fuselage covering, thus increasing speed of construction, and eliminating rivets, which create substantial drag in the air. (Pure aluminum can be spotwelded, but the alloy dural is very difficult.)

Low alloy steel, which "will match or surpass present aluminum alloy planes in strength and safety factors," contains less than two percent of strategic alloys, as contrasted with more than 25 percent of such alloys in stainless steel.

Other builders of steel planes have used the stainless type because they

feared corrosion in places inaccessible to inspection. On the other hand, airframes have been made of steel tubing for many years, the corrosion problem being met with various moisture-proof coatings.

Coatings Prevent Corrosion

The writer is told by a steel company that North American is protecting interior parts with coating mixtures, and, since the plane must be camouflaged anyway, regular airplane camouflage paint is used on the outside.

Federal aviation officials indicate that not one but several airplane manufacturers are making the shift from aluminum. North American says the results of its research, which centered around development of a cold reduction process, is being made available to other plane builders.

E. P. Bullard Celebrates 50 Years With Company

E. P. Bullard, Jr., president, the Bullard Co., recently celebrated his 50th year of active participation in the firm. The firm was founded by his father in 1880.

NAMES in the NEWS

C. P. Boggs has been appointed director of manufacturing, Hygrade Sylvania Corp. Mr. Boggs has held executive positions in the manufacturing division of the Corporation since 1932. Recently, he was assistant to executive vice president W. E. Poor.

Howard Coonley, chairman of the board, the Walworth Co. and former president of the American Association of Manufacturers has become chief of the Simplification Branch, Bureau of Industrial Conservation, War Production Board.

Clay C. Crawford, formerly engaged in aerodynamic research, has been appointed assistant to the chief, bureau of Priorities, Division of Industry Operations, War Production Board. He will handle liaison between the Bureau and the Priorities Committee of the Army and Navy Munitions Board.

For the Navy — Excellence in production for the Navy won a Navy "E" pennant for the Lodge & Shipley Machine Tool Co. Rear Admiral W. C. Watts, USN, presents the pennant to Company President William L. Dolle

W. E. Corrigan, vice president in charge of munitions and miscellaneous sales, American Locomotive Co., has assumed additional duties as head of diesel engine sales.

William H. Davidson has been elected president, Harley-Davidson Co., succeeding his uncle, the late Walter Davidson. He started as an apprentice in the factory and worked for the company about 13 years.

French E. Dennison, formerly in charge of the small commercial refrigeration development department, York Ice Machinery Corp., is serving as chief inspector, Philadelphia Ordnance District, War Department.

John Wilson, superintendent of the sheet mill, has been promoted to the position of production superintendent, Jessop Steel Co. He has been with the company since 1911. R. W. Aiken, previously chief engineer with Frazier-Simplex, Inc., has been named plant engineer.

Ralph F. Gow, works manager, of Norton Co., has become assistant in charge of procurement, Boston Ordnance District, War Department. Francis N. Luce, manager of control, has been recalled to active duty as captain in the Chemical Warfare Service.

Sam B. Heppenstall, Jr., formerly general sales manager, has been advanced to vice president in charge of sales, Heppenstall Co. Mr. Heppenstall entered the employ of the company 14 years ago, becoming assistant sales manager in 1933 and general sales manager in 1939.

James W. Hook, has resigned as president United Illuminating Co. in order to give full time to defense work at the Geometric Tool Co., of which he is also president.

Paul Keller has been appointed to manage the sales of tool, stainless and special steels for the Copperweld Steel Co. He had been manager of the Cleveland sales district.

Arthur L. Olsen, president, Racine Iron & Wire Works, has been commissioned a lieutenant in the U. S. Navy.

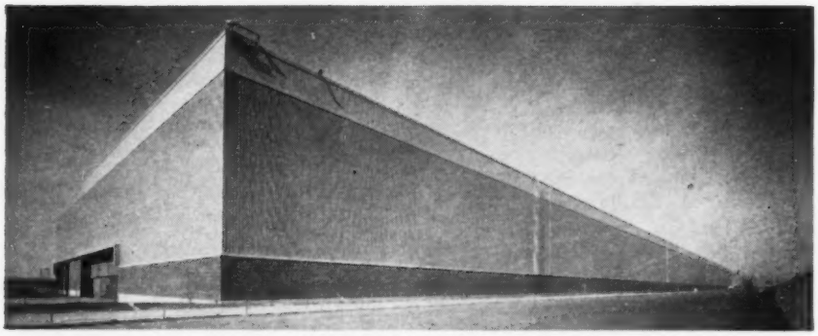
W. S. Scruggs has been elected vice president, St. Paul Hydraulic Hoist Co.

Promoted by Jessop Steel — *Heads Steel Sales*

JOHN WILSON

R. W. AIKEN

PAUL KELLER



In the Heart of Texas—Somewhere in Texas, this 12 city-block long bomber assembly plant was completed last month. It is windowless

He will continue his duties as general manager.

E. A. Taylor has been appointed works manager to coordinate wartime production in all Detroit plants of the Hudson Motor Car Co. For 17 years, Mr. Taylor has been in charge of active manu-

facture for General Motors Trucks: from 1924 to 1929 in the Moline, Ill., plant of Yellow Truck and from 1929 to the present in the Pontiac plant.

Harold P. Wade, formerly executive engineer, Packard Motor Car Co., will manage Adel Precision Products Corp.'s Detroit engineering office.

Joseph T. Wright has been appointed manager, Compressor and Tool Div., Holyoke, Mass., works of Worthington Pump & Machinery Corp. He has been assistant works manager, Lodge & Shipley Machine Tool Co., and subsequently organized J. T. Wright Co. Later, he was with Harris-Seybold-Potter Co.

BUSINESS ITEMS

Fray Machine Tool Co., Glendale, Calif. has appointed Douglas Machinery Co., 150 Broadway, New York, N. Y. as exclusive sales agents for the eastern United States.

Manning, Maxwell & Moore, Inc., has liquidated its railway and mill supplies division at Jersey City, N. J. The liquidation has been made in order to expand the strictly manufacturing end of the company.

Allen-Bradley Co. has moved its Chicago Office to 624-630 W. Adams St.

Interaircraft Machine Shop, Inc., 3851 Medford St., Los Angeles, Calif. have taken over the manufacture and sales of Hydra-Grip Co. products.

Harold E. Trent Co. has moved to Leverington Ave. & Wilde St., Manayunk, Philadelphia, Pa.

Westinghouse Electric & Mfg. Co. has appointed R. S. Reosh manager of the Houston, Tex., office.

OBITUARIES

Hammond B. Douglas, 58, for 22 years superintendent Washburn Co. and for the past six years WPA coordinator for Worcester, Mass., died recently in Worcester.

Walter M. Nones, president, chairman of the board and founder, Norma-Hoffman Bearings Corp., died March 10 in Stamford, Conn.

Herrman A. Schatz, 55, president and treasurer of the Schatz Manufacturing Co. and the Federal Bearing Co., died recently in Poughkeepsie. He became president of the Schatz Co. in 1908 and of Federal Bearing in 1915. He was formerly police commissioner of Poughkeepsie.

Carl G. Sjolander, 65, veteran employee of the Norton Co., died recently. He was recognized as one of the highly skilled designers in this country, and frequently had traveled as a demonstrator for the company. In 1898 he went to England and Scotland with Charles H. Norton, founder of the company, to give the first cylindrical grinding demonstration ever held there.

Ansil Henry Thacker, managing director, Western Machine Works, Ltd., died recently in Vancouver, B. C. With the late William Beer he started the firm of Thacker & Beer in 1908; later the firm was incorporated under its present name.

MEETINGS

American Foundrymen's Association. Annual convention. Cleveland, Ohio. April 20-24.

American Gear Manufacturers Association. Annual Convention. Hotel Hershey, Hershey, Pa. May 11-13.

American Iron & Steel Institute, General Meeting. Waldorf-Astoria, New York, N. Y. May 21.

American Management Association. Production Conference. Hotel Astor, New York, N. Y. May 13-14.

Chamber of Commerce of the United States. Annual Convention. Washington, D. C. April 27-30.

Society for the Advancement of Management. Semi-Annual Meeting. Hotel Gibson, Cincinnati, Ohio. May 7-9.

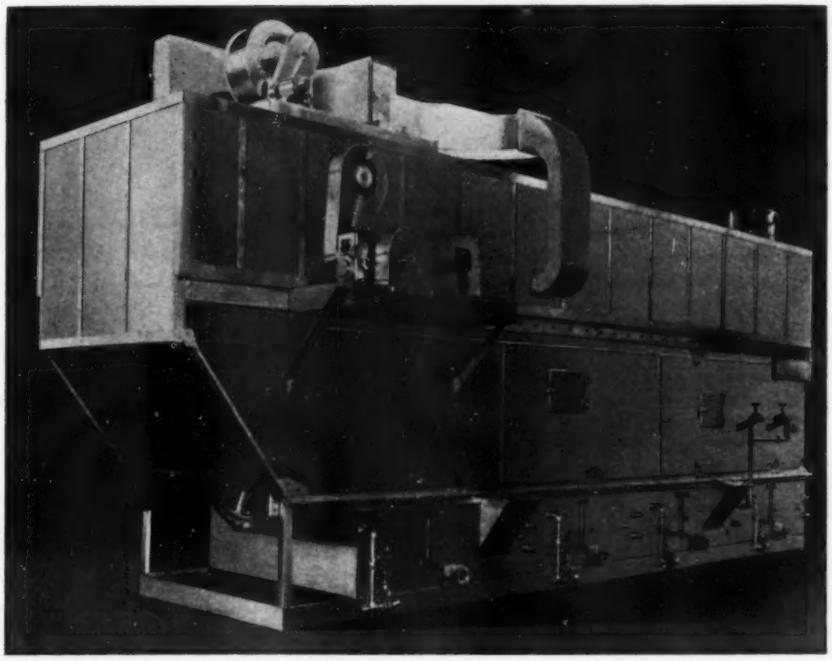
National Electrical Manufacturers Association. Annual Meeting. The Homestead, Hot Springs, Va. May 10-16.

National Metal Trades Association. Annual Convention. The Biltmore, New York, N. Y. May 19-20.

More Machine Tools—To further increase its production of machine tools to meet the requirements of the expanded U. S. war production program, Gisholt Machine Co. recently completed this 50,000 sq. ft. addition

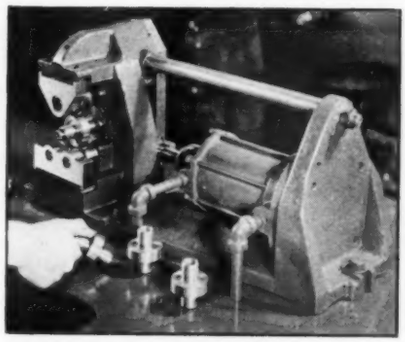
SHOP EQUIPMENT NEWS

Detroit Rex Conveyorized Machine Cleans, Dips Metal Parts; Takes Minimum Space



A two-strand, cross-rod conveyorized processing machine has been specially designed and built by the Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich., for the cleaning and treatment of aluminum-alloy aircraft parts. It follows an approved U. S. Army and British procedure for the treatment of aluminum alloy sheets used in aircraft to make them less pervious to the effects of air, and to provide a better paint bond. The machine incorporates hot alkali wash, hot water rinse, hot chromic acid dip, and oven dry off.

The machine has the advantages of a compact self-contained unit that eliminates special handling systems and tanks spread out over a large floor space. Further, floor saving is obtained by the oven being located over the top of the dip tanks, with the return flight of the conveyor passing overhead through the oven back to the loading-unloading station. Steam and acid fumes are withdrawn from the plant. The machine is fabricated from steel plate, reinforced with structural steel, and is of all-welded construction. The tanks are tested for a working pressure of 200 lb. per sq. in. The units can be built in various sizes to accommodate individual production requirements.

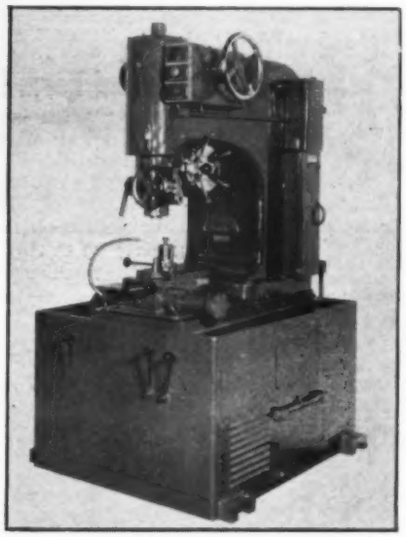


New Method Steel Stamps Develops Precise Marker

A special machine has been developed by New Method Steel Stamps, Inc., 143 Jos. Campau St., Detroit, Mich., to mark the periphery of the rotors used in small hydraulic pumps with the direction of rotation, name and part number. This operation is performed prior to slotting, so that it cannot deflect the slots from true position. The splined portion of the hole on the rotor is used to locate the position of the markings, so that when broached, the markings will be precisely located between the slots. The machine is operated by a control valve under the operator's foot. Each stroke of the piston rod reciprocates a shaft on which the part is mounted. This shaft is geared to another shaft on which the roll marker is mounted. The machine is rapid in operation and is capable of marking up to 500 rotors per hour.

Snyder Semi-Automatic Miller For Radial Engine Master Rods

Clearances for articulated connecting rods are milled in the master rods used in radial aircraft engines on a semi-automatic milling machine built by Snyder Tool & Engineering Co., 3400 E. Lafayette St., Detroit. Both roughing



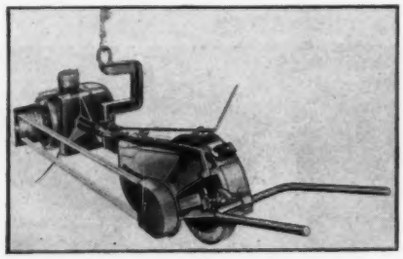
and finishing operations are performed on this machine, which will handle either solid or split-type rods. Since the cutting cycle of the machine is automatic, being hydraulically operated and electrically controlled, one unskilled operator can maintain continuous production tending several such machines. A pilot light indicates completion of the machining cycle.

Double-End Carbide Tool Grinder Built by Willey's

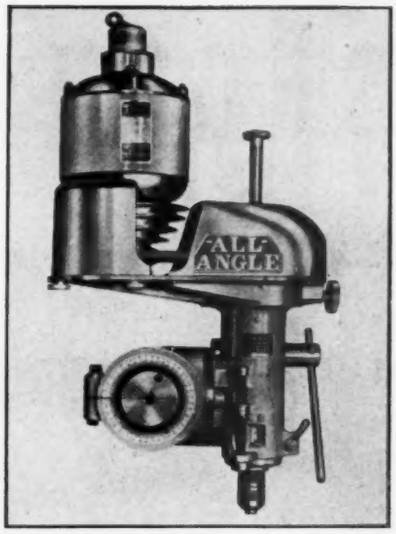
A Model No. 24 double-end carbide tool grinder announced by Willey's Carbide Tool Co., 1342 W. Vernor Highway, Detroit, Mich., is controlled by a drum type reversible switch. The motor can

Marschke Swing Frame Grinder Convenient for Foundry Use

A newly designed Marschke swing frame grinder for ingot, billet, and slab grinding in steel mills and foundry snagging operations is offered by the Vonnegut Moulder Corporation, 1802 Madison Ave., Indianapolis, Ind. Wide variations in operating conditions are met by provisions for easy angling of the wheel head up to 90 deg. from vertical, both to right and left, and for adjusting the handle to convenient low and high grinding positions. Three spindle speeds maintain efficient wheel rim speed at all stages of wheel wear.



be furnished for 220 or 440 volts, 60 cycle, three phase, 3450 r.p.m. The motor shaft is tapered at both ends, insuring positive wheel alignment. The diamond wheel is lubricated by gravity. Spindle is 43 in. above floor. Floor space is 40 × 18 in. Tool rest table is 16 × 7 in., and net weight is 400 lb.



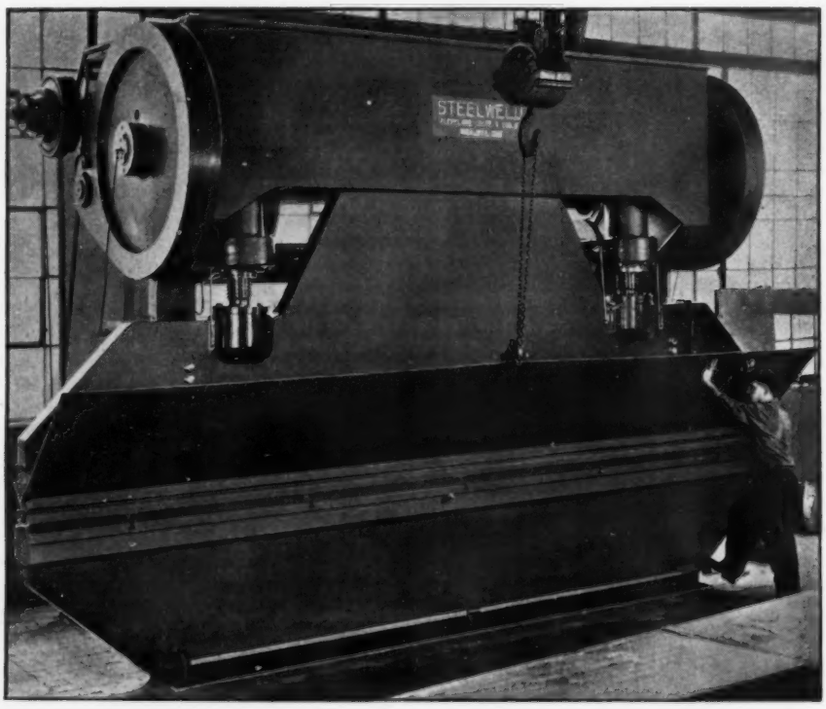
Fray All-Angle Head Mills Drill-Bushing Recesses

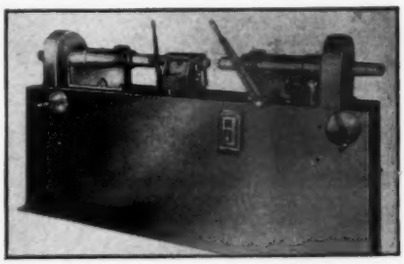
Manufacture of drill bushings is said to be speeded up with the milling head offered by Fray Machine Tool Co., Glendale, Calif. The raising and lowering of the milling machine table has been eliminated by the use of a traveling quill. Stepped recesses in drill bushings can be milled to close limits, on a production basis, by semi-skilled operators. Conventional all-angle features permit milling, drilling and general shop work with one work set up.

Steelweld Machinery's Bending Press Will Bend And Form Plate Up to Twenty Feet in Width

The Steelweld Machinery Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, announces a new Steelweld bending press, Model L5½-12, with double bed and ram extension for bending and forming plate up to 20 ft. in width. Various plate thicknesses may be handled, depending upon the plate width. The frame is of one-piece all-welded steel construction.

Bending, forming, blanking, drawing, and multiple-punching operations may be performed on the press. Gages and indicators provided make it a simple matter to otbtain identical results repeatedly with a set of dies.





Double-End Burring Machine Developed by Pines Engineering

A double-end burring machine has been developed by the Pines Engineering Co., 123 Main St., Batavia, Ill., to profile the ends of short tubes that are used in the manufacture of incendiary bombs. The tubes are loaded into the automatic chuck by means of a hand-operated positioning device, which also serves to automatically eject the parts from the chuck after the operation is completed.

The tools supplied with this machine are made to receive standard ⅜ in. square cutter bits which are inserted in the end of the tool through square openings and held in place by set screws. These bits are ground to produce the desired profile on the end of the tube and can be varied from a simple burring or chamfering operation to any type of end-finishing that may be desired.

When Minutes Count

Sunoco Saves Production Hours

Prolongs Tool Life • Saves Down-time • Minimizes Rejects

Speed and more speed . . . production on a scale never before contemplated . . . this is the immediate objective of the machine tool industry.

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PERFORMANCE DATA

OPERATION—Turning 5" diameter S. A. E. 1045 Steel @ 270 R.P.M.

MACHINE—"American" Pacemaker Multi-Production Lathe.

CUTTING LUBRICANT—1 part Sunoco to 20 parts water.

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SUNOCO

SUN PETROLEUM PRODUCTS HELPING INDUSTRY HELP AMERICA

Milling Speed-Feed Calculator Prepared by Cincinnati Milling

A milling calculator which will aid in quickly selecting the correct cutting speeds and feed rates for many milling jobs has been prepared by the Cincinnati Milling Machine Co., Cincinnati, Ohio. These calculators are sold at a price of 50 cents each. The size and kind of cutter, the work material, depth of cut, cutting speed, feed rate and horsepower required are all calibrated on the dials of the calculator. By properly setting the dials for each situation,

the most effective combination of speed and feed from the standpoint of power, tooth load, and finish, can be readily determined.

The proper milling speed is easily determined by setting the diameter of the cutter in one window, the kind of cutter in another, and reading the proper cutting speeds opposite the type of material being milled. The selection of the correct feed rate cannot be as simple since more factors are involved. However, a series of simple settings can be made to determine the feed rate which will not exceed rated horsepower, will not produce excessive feed per tooth, nor excessive feed per revolution.

Taps Reconditioned On New Detroit Tap & Tool Machine

Designed to help alleviate current difficulties in securing precision ground taps, the tap reconditioner announced by the Detroit Tap & Tool Co., 8432 Butler St., Detroit, Mich., combines in one unit facilities for chamfering, for spiral pointing and for point polishing.

The tap chamfering unit, located at the left of the machine, is of the precision collet type. It will accommodate collets from the smallest machine screw size up to the 1¼-in. standard tap shank size. Taps with from two to seven flutes may be handled. Safety stop pins limit the movement of the

chamfering unit for taps of different numbers of flutes. A manual type diamond dresser is provided for the chamfering wheel. The spiral-pointing unit employs a saucer-type wheel, and is designed to accommodate taps from the smallest machine screw to ½-in. diameter.

Sunray Fluorescent Lamps For Use in Limited Space

Sunray Electric, Incorporated, Warren, Pa., announces a new sunray lamp which is said to be the smallest standard type fluorescent lamp commercially available. It is only 15 in. in over-all length, and is rated at 14 watts. It is available in both white and daylight styles, and is intended for use where space is limited.

Progressive Welder Attachments Replace Balance Machining

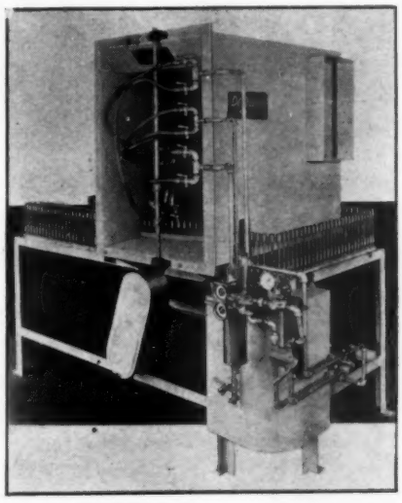
Welding gun attachments for balancing machines have been developed by the Progressive Welder Co., 3001 E. Outer Drive, Detroit. With these attachments, "balance-machining" of rotating parts on which accurate dynamic balance is required is unnecessary; nor is it necessary to leave excess stock on the part for this purpose. The welding attachments are used to spot weld a balancing lug of the correct weight to the parts being balanced.

Laboratory Tests Indicate Correct Grade of Steridol

The C. B. Dodge Co., Westport, Conn., is supplying, under the name Steridol, a line of special cutting oil germicides. Each oil is adapted to the shop after bacteriological and chemical analysis of the compound under conditions of actual use. The type of Steridol supplied after such examination is guaranteed to kill bacteria in the cutting oil compound and effect practical sterility, without irritating the skin of workers. It is also claimed that it will not give off druggy odors, reduce wetting power, or corrode metals.

DeVilbiss Builds Automatic Shell Painting Machine

An automatic machine for painting small shell and shell parts has been developed by the DeVilbiss Co., Toledo, Ohio. This machine is built around a chain-on-edge, variable-speed con-



veyor. Spindles for supporting the shell are of the removable type and are equipped with flat surface pulleys for rotation inside the spray booth. Spray guns are the automatic air-piston type with adjustable cam-operated spray control.

Portable Federal Gage Checks 500-lb. Demolition Bombs

A portable gage, Model KP-96, for checking the wall thickness of 500-lb. demolition bombs is being built by the Federal Products Corp., 1144 Eddy St., Providence, R. I. Roller bearing lower

How You Can Make 200 Special Tools From ONE Style of Carboloy Standard Stock Tool

To get special carbide tools on the job *FAST*, a large bushing and bearing manufacturer adapts hundreds of special shapes from Standard-Stock Carboloy Tools. Illustrated are a few of over 200 different shapes, used for chamfering, grooving, forming, etc., that this manufacturer adapts from just ONE style of Carboloy tool!

To do this job *fast* they maintain a stock of these standard tools and grind the shapes as required. Many of the simpler types are ground to shape in 5 or 10 minutes, while others, containing complicated angles and radii, held to limits up to .0005", require proportionately longer periods. In every case, these "special" tools can be ground and placed on the job the *same day* requested! No delays awaiting deliveries.

Carboloy Standard-Stock Tools—available in 10 styles—are manufactured by Carboloy in "mass production" quantities and are always available faster than specially shaped tools. Check your special-shape tool drawings against Carboloy Standard specifications. Write for Catalog GT-140.

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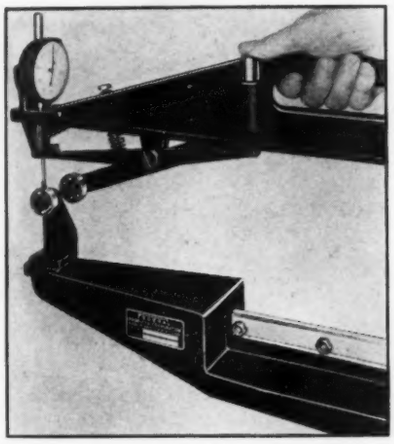


anvil, and roller bearing pressure unit on the upper arm facilitates handling of the gage. The upper roller unit has sufficient tension to hold the lower roller anvil firmly in contact with the inside surface of the bomb. The indicator contact point is made of tungsten carbide, and is raised by pressing a plunger in front of the foremost hand grip. An interchangeable steel slide, along the lower section, guides the bomb body up to the locating stop.

Penn Metal Produces Tool Stand for Three-Shift Plants

A tool stand designed for three-shift operations is manufactured on a production basis by the Penn Metal Corp. of Penna., 36 Oregon Ave., Philadelphia, Pa. This stand is equipped with three drawers which lock separately—a single

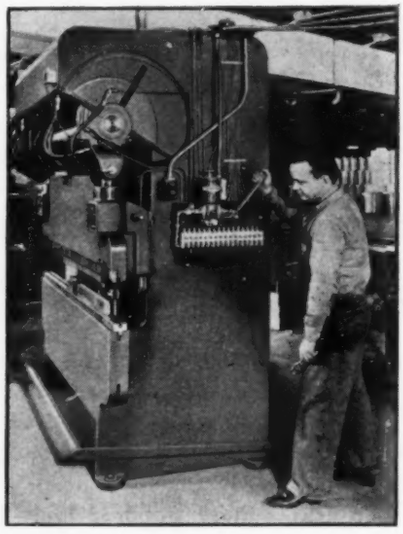
drawer for each shift. Drawers are 18-in. wide, 16-in. deep and 5-in. high. Over-all size of each unit is 30-in. wide, 18-in. deep, and 32-in. high.

Woven Grinding Wheels Made With Strands of Wool Yarn

The Woven Grinding Wheel Co., Milwaukee, Wis., offers a grinding wheel built by winding strands of wool yarn on an arbor between flanges, and flowing into these windings a plastic mixture of abrasive and bond, until a wheel of the desired diameter has been built. The yarn reinforces the wheel providing extra strength to prevent bursting and making the wheel safe for grinding at high speeds. The wool is wound with an oscillating movement, so that the strands lie diagonally. Charring away of the wool in grinding gives clearance to the cutting edges of the abrasive crystals, and opens new surface voids on the face of the wheel, preventing loading or glazing. When worn down in size, the wheels can be built up again to the original diameter.

Lincoln Engineering Develops Centralized Lubricating System

A number of features are incorporated in the centralized lubricating system developed by the Lincoln Engineering Co., St. Louis, Mo. The system consists of a number of injectors—one for each bearing to be lubricated, each con-



nected to the bearing by tubing or flexible high-pressure hose as required, and each individually adjusted to discharge the required amount of lubricant. A single lubricant supply line connects the pumping unit and the Centro-Matic injectors. A wide range of pumping units are available.

Sabin Truck for Drums Operated by One Man

A one-man truck for handling steel drums, wood barrels and kegs, has been developed by the Sabin Machine Co., 6536 Carnegie Ave., Cleveland, Ohio. One trucker, without helper, can handle units weighing up to 1,000 lb. He simply runs the truck up to the barrel or drum and slips an adjustable hook over the top. By pulling the handle, the truck is loaded automatically. An extension foot pedal increases leverage for easy "breakover". The third wheel, housed in the foot pedal,

insures perfect balance, load support, and enables truck to stand alone when loaded. Either rubber tired or malleable wheels are available.

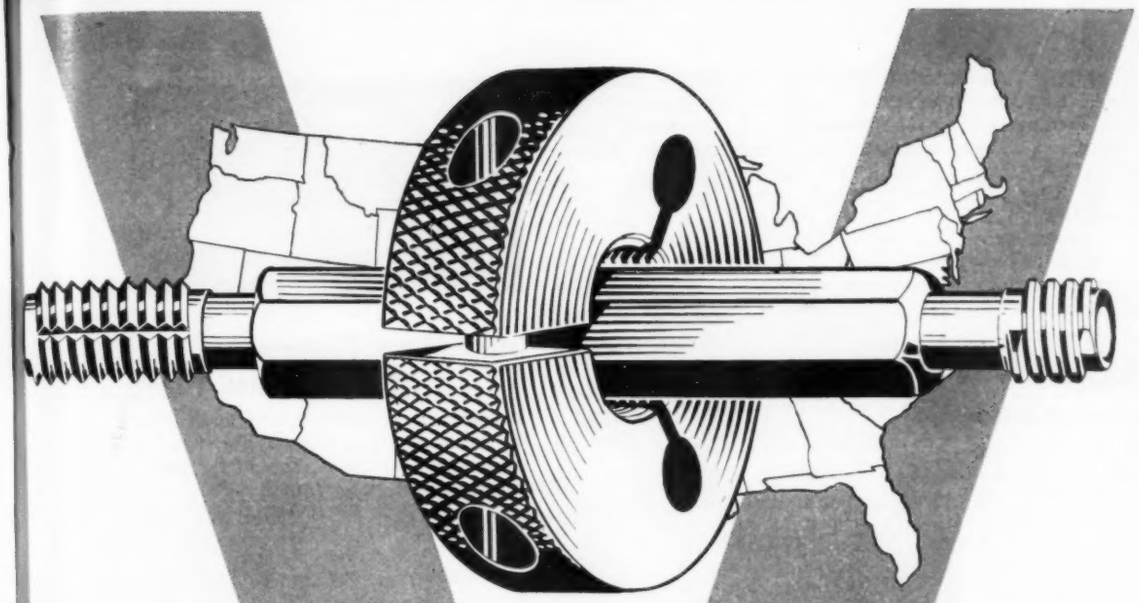
Goodrich Sandblast Hose Conducts Static Electricity

Again putting to practical use its comparatively recent research on electrically conductive rubber and synthetic rubber compounds, the B. F. Goodrich Co., Akron, Ohio, announces a new sandblast hose employing these principles. There is no wire used in this hose. The rubber compound carries away the static elctricity as fast as it forms.

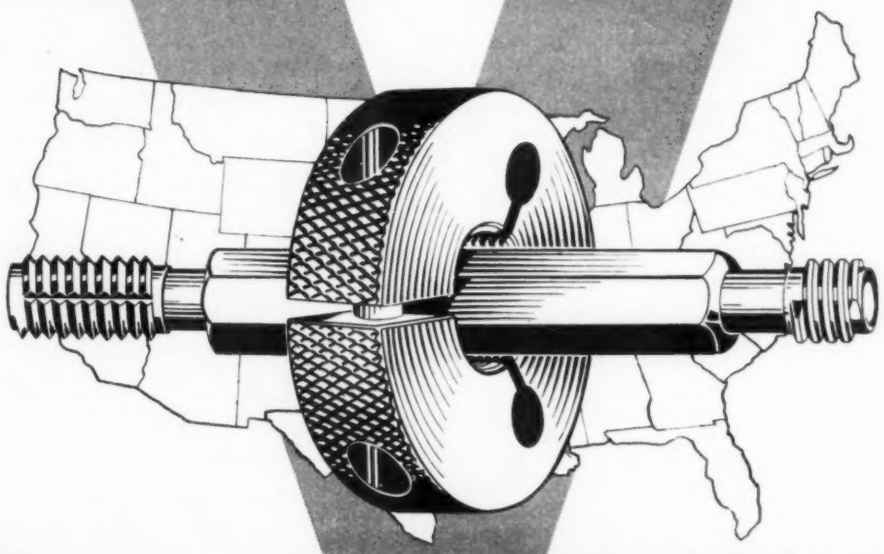
Conventional rubber hose has a resistance exceeding one quadrillion ohms per centimeter cube, while the resistance of the compound used in this new hose is only 3000 ohms per centimeter cube. For the high voltages of static electricity the compound is practically as good a conductor as metal.

Blackmer Pump Announces Basket-Type Strainers

A series of strainers for pipe sizes from 1 to 6 in. has been put on the market by the Blackmer Pump Co., Grand Rapids, Mich. Known as the "Ezy-Kleen" Line, they follow the basic de-

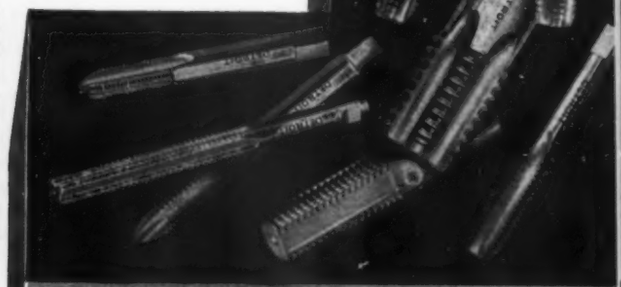


DETROIT TAP'S 1942 THREAD GAGE CAPACITY



TOTAL U.S. PEACE TIME THREAD GAGE REQUIREMENTS

All "Detroit" thread gages, both ring and plug, are made from special alloy steel of highest wear-resisting properties. Many sizes stocked. Others available on quick delivery.



DETROIT TAP & TOOL Company 8432 BUTLER DETROIT

sign of the basket-type strainer. The baskets are made of steel or brass woven wire cloth in fine, medium or coarse mesh, and are reinforced. The strainers are furnished in five sizes from 50-g.p.m. to 700-g.p.m. They are suitable for operating pressures up to 50 lb. per sq. in., and for temperatures up to 275 F. Strainers for higher pressures and temperatures can be furnished on special order.

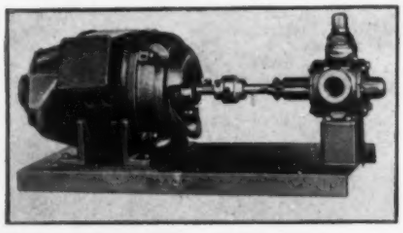
Lewis-Shepard Shell Truck Designed for Large Sizes

Designed to handle large shell in munition plants, a new hydraulic-release shell truck is announced by the Lewis-Shepard Sales Corp., 245 Walnut St., Watertown, Mass. The truck will

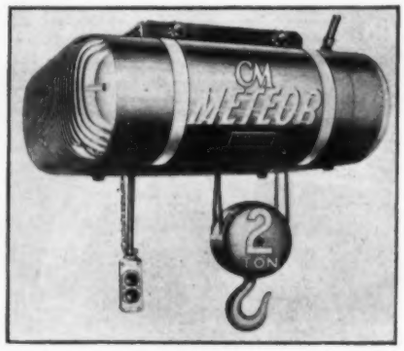
handle shell up to 72 in. in length, and 16 in. in diameter, with a total weight of 2,800 lb. It is designed so that the load pivots around a point near its center of gravity. This keeps the load in balance so that one man can easily raise or lower it.

Direct-Connected Rotary Pumps Made by Blackmer

A complete line of direct-connected rotary pumps has been placed in production at the Blackmer Pump Co. plant at Grand Rapids, Mich. The pumps, known as the "D-C" line are furnished in standard capacities of 5, 10 and 20 g.p.m., and for pressures up



to 100 psi. They will deliver rated capacity at an operating speed of 1800 r.p.m. Standard units consist of pump mounted on bedplate with flexible coupling for direct connection to an electric motor, steam turbine or gasoline engine. The pumps are self-priming and positive displacement.



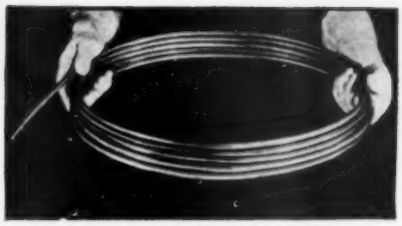
Chisholm-Moore Electric Hoist For Use Either Indoors or Out

A new Meteor heavy-duty electric hoist has been announced by the Chisholm-Moore Hoist Corporation, Tonawanda, N. Y. The hoists are available in capacities of one-half ton and up. Aeroplane-type cooling fins dissipate the heat generated by gears and load brakes. Weatherproof design permits use indoors or out. The electrical system permits only 110 volts to pass through the pushbutton station.

Balanced Hydraulic Valve Built by Galland-Henning

A new type of high-pressure hydraulic operating valve has been announced by the Galland-Henning Mfg. Co., 176 W. Wisconsin Ave., Milwaukee, Wis. Users of hydraulic power at pressures of 1,000 lb. and over have found manipulations of valve levers tiring, and there has

been a tendency towards "pressure-locking." This is avoided in the new type valve because the hydraulic pressure inside is always balanced. The valve is built in four sizes to fit hydraulic pressure lines of ⅜-in., ½-in., ¾-in., and 1-in. diameter.

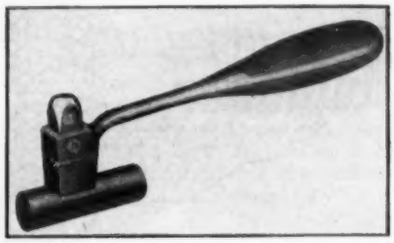


Imperial Brass Produces Soft Temper Steel Tubing

A soft temper steel tubing, which is copper coated and tinned, and can be used to replace copper tubing for many purposes, has been announced by The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. The Imperial Bundy tinned steel tubing is said to meet the requirements of a wide range of uses such as gasoline oil lines, machine tool hydraulic and lubrication lines, conduit tubing, connecting lines for oil burners, vacuum lines, and refrigeration condensers. Bursting strength ranges from 17,800 to 8,700 lb. per sq. in., depending on size.

Matthews Stamp Holder Permits Stamp to Float

A new steel stamp holder, introduced by J. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa., has a V-shaped



face, allowing right-angle alignment of stamp when marking round objects. The stamp is held in place by means of a "Shepherd Hook" holding device. The stamp floats up or down, in order to find its own location on varying diameters of round or oval shapes. Holder can also be used when stamping flat surfaces. Stamps will not drop out when not in use, nor will they bounce out from rebounds due to hammer blows. Any size stamps can be used in the holder. Where it is preferred that stamps be fixed and not removable, the hook is replaced by a pin.

Paragon-Revolute Designs Continuous-Type Copier

A new continuous-type copier has been designed by the Paragon-Revolute Corporation, 77 South Ave., Rochester, N. Y., for making contact prints on subdued-light type photographic materials. Known as the Revolute 8F Continuous Copier, it will make reproductions rapidly from any type of original up to 44 in. in width, and of any

CHECK these advantages of the Torrington Needle Bearing—advantages that have been tested and proved in thousands of applications—and see how every feature can be utilized to fill a wartime need in *your* product designs.

1. *The Needle Bearing is available for prompt delivery* on priority orders, in the standard sizes and designs that are most practicable today. Production capacity at Torrington has been expanded to care for all essential requirements with the promptness you need to maintain your manufacturing schedules.

2. *It is easy to install,* ideally suited for high-speed production line methods. Built as a single compact unit, the Torrington Needle Bearing is pressed into place in the housing in a quick, simple operation.

3. *It conserves materials* in other parts of your product design. Because the bearing's outside diameter is small in proportion to capacity, you can use small-diameter housings, requiring less material.

4. *It improves product performance* and reduces power requirements, because of its low coefficient of starting and running friction.

5. *It needs little attention* in service. As a result of its efficient system of lubrication, only occasional renewal of lubricant is necessary. Its high load capacity assures long bearing life, even in continuous operation under heavy loads.

Let a Torrington engineer show you how this unusual bearing can help you key your designs to wartime conditions. For details, wire, phone or write for Catalog No. 105.

THE TORRINGTON COMPANY
TORRINGTON, CONN., U. S. A. • *Estab. 1866*
Makers of Needle and Ball Bearings
New York Boston Philadelphia Detroit
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EVERY FEATURE
FILLS A WARTIME NEED

TORRINGTON NEEDLE BEARING

INCREASED EFFICIENCY

Torrington Needle Bearings reduce power consumption in the "Lockformer" line of sheet metal working equipment—and with thousands of machines in daily use over a five-year period, bearing replacement has been negligible. Compactness of the bearings is an additional advantage.

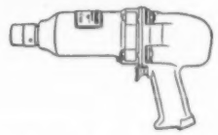
THE LOCKFORMER COMPANY

ELIMINATION OF WEAR

The Needle Bearing's low coefficient of friction virtually eliminates wear in the control column of the CESSNA T 50. Replacement costs are kept to a minimum at points where Needle Bearings are used, which include landing gear, aileron hinge, and wing flap hinge.

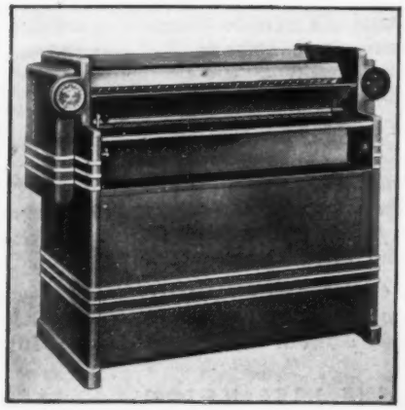
CESSNA AIRCRAFT COMPANY

LIGHTNESS IN WEIGHT



Light weight and small size in proportion to power rating are outstanding features of air-operated portable tools. Compact, high-capacity Needle Bearings aid in attaining these desirable features in this impact wrench manufactured by Ingersoll-Rand Company.

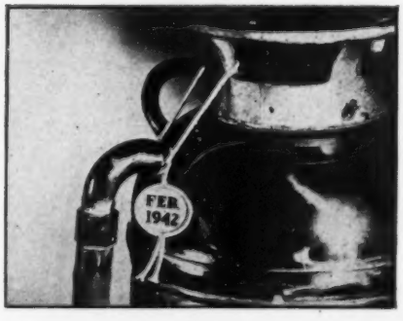
INGERSOLL-RAND



length. An 8-in. diameter Pyrex glass cylinder is provided and the original and sensitized material revolves with this cylinder. The photographic materials do not have to be handled in special dark rooms. No focusing is necessary and no lenses are required.

Stoffel Seals Guard Against Tampering or Substitution

Stoffel Seals Co., Inc., 188 Water St., New York, N. Y., offers a completely tamperproof safety and inspection seal. These seals guard against tampering, alteration or substitution. They are made of two components: the preshaped metal seal-cup, and the individualized identification disk, multicolor printed.



The seals can be permanently applied with either string, thin cord, or two-ply wire, using light-weight sealing pliers.

Solid Reamers Resized By Abrasive Engineering

The Abrasive Engineering Corporation, Spring Lake, Mich., resizes all standard solid high-speed steel reamers to their original diameters. Standard-size reamers can also be increased in diameter to make special reamers. The amount that reamers can be increased depends on its diameter and the thickness of the teeth, but it is said that in most cases it is possible to increase size from 0.020 to 0.030 in. The diameter is increased by forging to make each tooth slightly higher. Photomicrographs show that the forged section of such reamers is refined, and it is claimed that the reamers resized by this process will ream more holes than new ones. The process is not applicable to helical reamers.

Doall Supply Cabinet Stores Saws, Files and Attachments

Continental Machines, Inc., 1301 Washington Ave., S., Minneapolis, Minn., offer a Doall supply cabinet for storing saws and files. Twelve bins will

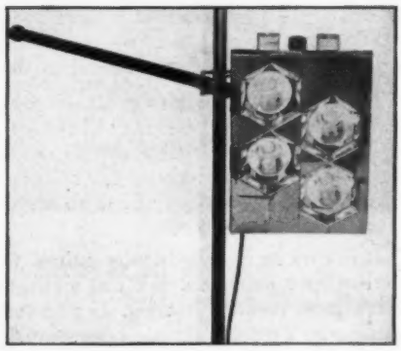
take over 8,000 ft. of saw in 100-ft. coils. Over the saw-box bins a curved shelf forms a support to provide room for twelve file bands. Eight hooks at the left are used for small file bands or file band extensions. Space is also provided for attachments and tools. All shelves and partitions are screw fastened so that adjustments in sizes can be made.

Hygrade Sylvania Lamp Starters Stop Flashing of Failed Lamps

A line of fluorescent lamp starters, designed to protect ballast and starter, and to eliminate the flashing of failed lamps, is announced by Hygrade Sylvania Corporation, Salem, Mass. Automatically opening the circuit when a lamp fails, the Premium Mirastats are especially suitable for installations that make immediate replacement of a burned-out lamp impractical.

Elipso Standlite Provides Plants With Protective Illumination

Protective illumination around industrial plants is provided by the Elipso Standlite, built by the Goodrich Electric Co., 4600 Belle Plaine Ave., Chicago, Ill. Due to its elliptical shape, the fixture provides a wide lateral distribution of light. With proper spacing of fixtures, a brilliant barrier of light is created around property lines without



illuminating buildings and grounds. Watchmen remain in darkness, and can instantly spot the entrance of any intruder into the lighted fence or boundary area.

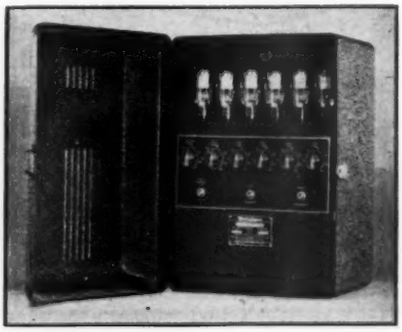
Timber-Lock Skid Platforms Have Interlocked Oak Frames

An interlocking "wood-weld" process, developed by Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa., gives a non-steel-frame skid platform strength comparable to that of a welded steel platform. Deep cut grooves run along the entire length of the platform deck board. Into each of these,

the supporting hard oak beam is tightly fitted, thus interlocking platform and beams in a vise-like grip that eliminates rocking and shaking. Beam and deck are bound together with cement-coated helical nails. Legs are of formed steel bars, joined to the leg beam by heavy forged steel bolts. The Timber-Lock platform is available in standard widths and lengths with plain or armored ends.

Westinghouse Announces New Weld and Sequence Timer

For use in automatic resistance spot, butt, or projection welding, a new weld and sequence timer is announced by Westinghouse Electric & Mfg. Co., Pitts-



The fate of a nation was riding that night

WE who carry on a great American name face the tasks ahead in a spirit of hope rather than sacrifice.

For we know from the example of Paul Revere that the reward of effort is not merely victory. It is a better way of life for many more of us. We have found that looking back on a glorious past brings calm confidence in the future.

To commemorate the 167th anniversary of Paul Revere's Ride, we have prepared a de luxe brochure of Longfellow's poem, with four beautiful colored prints by the famous illustrator, Joseph Boggs Beale, in the belief that many Americans will wish to own them.

We will send it to you on receipt of 25¢ in coin or a 25¢ Defense Stamp and the net proceeds will be divided equally between the Army and Navy relief societies as a contribution from patriotic Americans. Use the coupon below for convenience.

REPRODUCED ON THIS PAGE ARE THE FOUR 8¾" x 9" PRINTS YOU WILL RECEIVE IN FULL COLOR, READY TO FRAME.

Revere
COPPER AND BRASS INCORPORATED
NEW YORK, N. Y.
Founded by Paul Revere in 1801

Revere Copper and Brass Incorporated
213 Park Ave., New York, N. Y.
Enclosed is 25¢ in coin or a 25¢ Defense Stamp for my copy of the Paul Revere anniversary brochure.

Name.....

Address.....

City..... State.....

burgh, Pa. The unit is 17¼-in. high, 12-in. wide, and 12-in. deep. Approximate shipping weight is 60 lb. The control transformer is wound or 115, 230, 460, 515 volts, 50 to 60 cycles. The solenoid relay is rated 25 amp. at 110 to 220 volts, and 10 amp., 440 to 550 volts. The timing circuit is fully electronic.

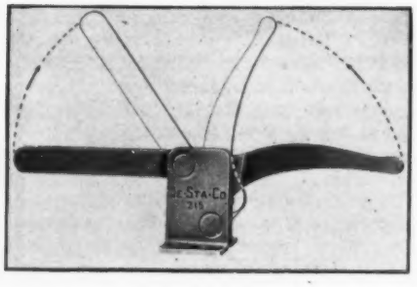
Aero Tool Countersink Has Micrometer Stop

Countersinking to predetermined depths and to tolerances of 0.001 in. is now possible with a micrometer stop countersink offered by the Aero Tool Co., 816 W. 5 St., Los Angeles, Calif. The

countersink is adjusted by light thumb pressure. A ball thrust bearing assures smooth, even operation. Cutters are available at ⅜-in. and ½-in. diameters, either at 82 or 100 deg.

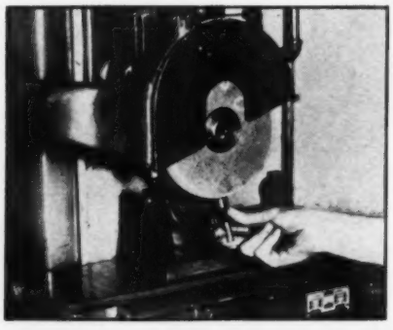
Light-Duty Toggle Clamp Added by Detroit Stamping

A light-duty, horizontal-style toggle clamp has been developed by Detroit Stamping Co., Detroit, Mich. This clamp has a pressure ratio of 50 to 1. When in "shut" position (as illustrated) both the handle and clamping bar are in a horizontal position, reducing height. Measurements are $8\frac{1}{16}$-in. across, $2\frac{3}{16}$-in. high, and 1⅜-in. by $2\frac{1}{16}$ in. at the base.



Scherr Radius Wheel Dresser Employs a Diamond Tool

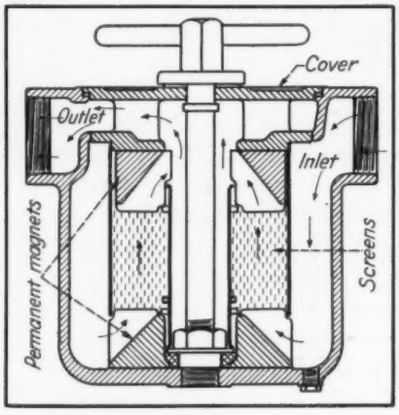
Either convex or concave radii grinding wheels from 0 to 1 in. can be addressed with the "Little Wonder" radius wheel dresser announced by George Scherr Co., Inc., 128 Lafayette St., New York, N. Y. The device is used in connection with a diamond tool and consists of a base made of cast iron. Swinging arm



is made of cast iron, heat-treated before finishing. Centers are turned at both point and sides, hardened and lapped true. Dresser can be set with regular one-inch micrometer, depth micrometer, or height gage.

New Frantz FerroFilter Has 200-Gallon Capacity

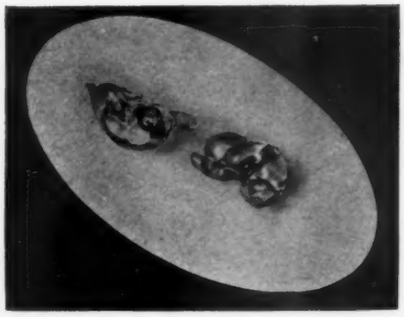
S. G. Frantz Co., Inc., 161 Grand St., New York, N. Y., has developed a permanent magnet FerroFilter with greater



capacity than any previous model of this type. Designated as the PQ-6, it has a capacity of 200 gal. per min., a 3-in. pipe size connection, and is 15⅝-in. high. It is especially adapted for removing fine iron and steel particles from circulating coolant systems.

Maico Plastic Ear Stopper Reduces Noise by 50 Percent

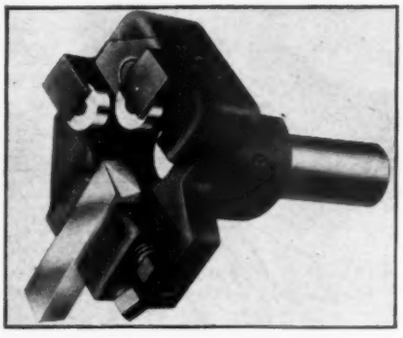
A plastic ear stopper that is fitted to the shape of an individual ear canal is announced by the Maico Co., Inc., 2632 Nicollet Ave., Minneapolis, Minn. Molds are made from impression material ap-



plied by a doctor, a dentist, or a technician. The mold is then reproduced in transparent plastic. The stopper reduces loud sounds and noises by 50 percent (or from 15 to 40 decibels).

Boyer-Schultz Develops Box Tool For Screw Machines

A new automatic screw machine box tool has been developed by the Boyer-Schultz Corp., 2110 Walnut St., Chicago. The body of this tool is made from forged steel, heat-treated for maximum



properties. Other parts are made from heat-treated alloy steels, finished to close limits. The tool is available in three sizes, Nos. 00, 0 and 2. Positive screw adjustment permits rapid setting.

Beryllium Copper Brush Springs Made by Instrument Specialties

Beryllium copper brush springs, made on special coiling equipment developed for small electroical applications, are announced by the Instrument Specialties Co., Inc., 240 Bergen Blvd., Little Falls, N. J. These springs are said to have higher safe operating temperatures than bronze, music wire or stainless springs, and more than twice the current carrying capacity of bronze. They are 1/32-in. long, have an outside diameter of 0.003 in., and a load deflection of five percent.

Mead Foot Control Unit Speeds Air Clamp Operations

A foot control for use with air clamps has been announced by Mead Specialties Company, 15 S. Market St., Chi-

PRACTICAL DATA FOR PRESENT PROBLEMS

Here are two books designed to help users of Molybdenum steels and irons to conserve all alloying elements, and possibly steel and iron, by getting the most in the way of strength, toughness and wear resistance with the lowest alloy content.

"MOLYBDENUM IN STEEL" covers the fundamental metallurgy of Molybdenum steels. Heat treatment – physical properties – applications – of a number of these steels are treated at length.

"MOLYBDENUM IN CAST IRON" covers the effect of Molybdenum in gray iron, giving suggested analyses for practical applications and detailed discussion of high strength (60,000 p.s.i. and up) irons.

Both books will gladly be sent free on request.

Climax Molybdenum Company
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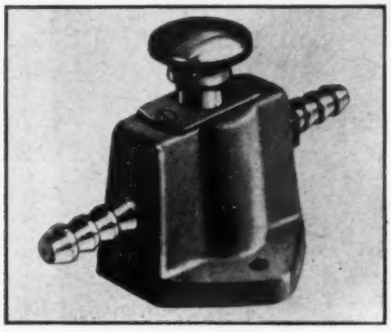
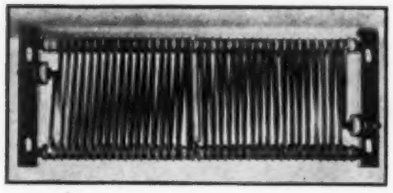
MOLY

cago, Ill. In certain operations, particularly in drill press jobs where the work cycle is short and the new work pieces are fed to the machine in rapid succession, this foot control facilitates operation.



Westinghouse Air Heater Made for Annealing Ovens

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces an air heater for ovens or furnaces used in annealing aluminum, glass and other materials. Designed for temperatures from 750 to 1,150 F., the unit has a



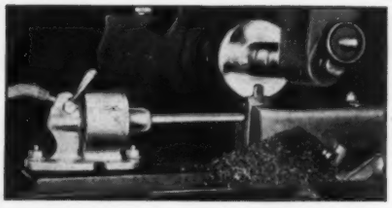
heating element consisting of a one-piece nickel-chrome ribbon, spirally wound around heavy porcelain insulators. Its rating is 5 kw. for operating on 230-volt circuits. Heater is 2½ in. thick, and it requires a mounting space 12 × 33 in.

Square D Pressure Switch Made For Air Compressors

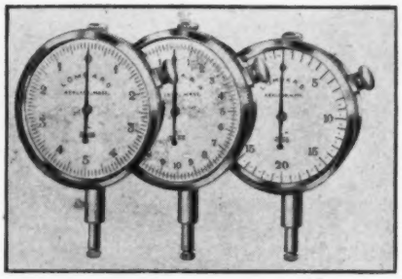
A pressure switch for air compressors, available either with or without release valve, is announced by the Square D Co., 6060 Rivard St., Detroit, Mich. The switch has 200-lb. pressure limit, 15- to 40-lb. differential, and is a two-pole device specially designed for use with intermediate size air compressor motors. The release valve opens and exhausts trapped air when the pressure switch opens to stop the motor. The motor is then free to start against no load.

Mead Model H4 Air Clamp Developed for Jigs and Fixtures

Mead Specialties Company, 15 S. Market St., Chicago, Ill., has added a Model H4 to its line of air clamps. It is used to hold aircraft parts for light milling operations. The clamp also may be used in assembly jigs. Groups of these air clamps can all be operated



by one master valve, saving considerable time in locking up and releasing work.

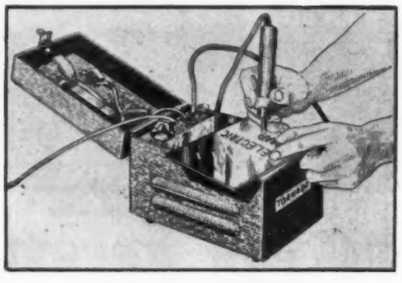


Lombard Governor Offers Three New Dial Gages

The Lombard Governor Corp., Ashland, Mass., offers a group of three "A" type dial gages. Brass gears and cases and stainless steel spindles are used. Dials are two inches in diameter and turn to set the zero to pointer position.

Breuer Electric Etchers for Marking Portable Equipment

Electric etchers of special design have been added to the line of the Breuer Electric Manufacturing Co., 5100 N. Ravenswood Ave., Chicago. These etch-



ers are specially adapted for marking dies, tools and other portable equipment. Red light tells operator when switch is on.

NEW MATERIALS

Transparent Cutting Oil Produced by Great Northern

The Great Northern Chemical Co., 1033 South Boulevard, Oak Park, Ill., offers a transparent cutting oil called Greatanol. The oil does not become an emulsion when mixed with water, and is non-injurious to the hands. In use it is ordinarily combined with three parts of water. Because of its transparency, cutting operations on which it is used are visible.

Miccroil Anti-Rust Oil Is Applied by Dipping

High flash point of Miccroil anti-rust oil introduced by Michigan Chrome and Chemical Company, 5340 East Jefferson Ave., Detroit, Mich. reduces fire hazard to a minimum. The oil dries in 30 to 45 min., is light in color and transparent, and does not alter the appearance of the part on which it is applied. Application is by hand-dipping. The oil contains 42.5 percent of total solids. Once applied, it provides constant protection until wiped off or removed with a solvent. It can be used on practically any surface which must be guarded from oxidation or corrosion.

Ply-Rustex Cream Prevents Perspiration Corrosion

Perspiration corrosion and other forms of rusting caused by the handling of metals during machining and processing operations can be eliminated with the application of a Ply-Rustex cream announced by the Milburn Co., Detroit, Mich., to the hands of the worker. The cream is applied before worker touches any part of article to be machined or processed. This enables free handling of the metal without gloves to help machining operation. Cream is non-irritating and easily removed.

Houghton "Cut-Max" Rifling Oil Speeds Finishing of Gun Barrels

E. F. Houghton & Co., Third, American and Somerset Sts., Philadelphia, Pa., have introduced a cutting oil that speeds up the rifling of machine gun barrels. This light body "Cut-Max" rifling oil flows freely through small orifices well ahead of the cutter. It is recommended for use in hydraulically-operated rifling machines.

Pawling Refinery Develops Sulphurized Cutting Oil

A sulphurized cutting oil has been produced by Pawling Refining Corp., Port Chester, N. Y. This oil carries more sulphur content than ordinary cutting oils, and this produces a cooler and faster cutting operation. The oil is transparent.

Reilly Blackout Paint Stops Dangerous Outside Reflection

A fully effective blackout requires protection against reflected outside light, as well as complete stoppage of inside light. According to officials of Reilly Tar & Chemical Corp., Indianapolis, Ind., Reilly No. 5 paint applied to the outside surface of windows and sky-

lights, gives a heavy, opaque surface that effectively blacks out all inside light. For outside metal surfaces, No. 40 paint stops light reflection, and makes such surfaces inconspicuous.

Hard coal tar pitch has proved an effective extinguishing agent for magnesium fires and for magnesium incendiary bombs. When spread over a hot magnesium fire the pitch softens and seals the burning magnesium metal with an air tight blanket, smothering the flames.

TRADE PUBLICATIONS

CONVECTION HEATING A folder on convection heating with the Super Cyclone Furnace has been prepared by the Lindberg Engineering Company, 2458 W. Hubbard St., Chicago, Ill.

GRAPHITE The United States Graphite Company, Saginaw, Mich., has issued two booklets; one, entitled "Graphite" discusses generally the uses of graphite. The other, "Graphitar," discusses specific applications of the material.

GRINDING HINTS The Norton Company, Worcester, Mass., is distributing a semi-monthly cartoon-style bulletin entitled "On the Grinding Line" carrying helpful hints on grinding.

INSTRUMENTS Industrial analyzers, indicators and recorders are included in List CEC issued by the Cambridge Instrument Co., Inc., 3732 Grand Central Terminal, New York, N. Y.

LIGHT ALSO FIGHTS General Electric Co., Nela Park, Cleveland, Ohio, has prepared a booklet on "How Light Can Help" which shows how proper lighting will aid in the Victory Program by increasing war production.

MARKERS Marking devices including type holders, type, roll markers, hand stamps, dies and machine engraving are listed in a bulletin put out by New Method Steel Stamps, Inc., 145 Jos. Campau St., Detroit, Mich.

METAL CLOTH AND SCREEN Wire cloth and metallic screen of all meshes and metals for industrial purposes are included in a catalog prepared by Cambridge Wire Cloth Co., Cambridge, Md.

MOTOR PARTS Publication A-30810 of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. shows parts for built-in universal motors which are used in drills, shapers and other machines.

PRODUCTION WEAPONS Products manufactured by the Fostoria Pressed Steel Corporation, Fostoria, Ohio, are illustrated in actual production lines in the U. S. war effort in Bulletin No. 242.

Advertisement

Warehouse Stocks of Steel Proving Big Help in Keeping Manufacturers Operating

A recent survey of industries indicates that most manufacturers are relying on nearby steel-service plants, more than ever before, to fill their requirements for small lots of steel. The leading company in this steel stock service is Joseph T. Ryerson & Son, Inc., who operate a vital network of 10 plants strategically located in busy industrial centers across the country.

The close cooperation between Ryerson's 10 plants offers two unique advantages.

First—Jobs at distant points; or the steel requirements of branch plants can be more quickly handled through local Ryerson offices. A local Ryerson office will take immediate action to assure prompt shipment.

Second—The local Ryerson office handles that *all important* "follow through" which assures prompt, accurate deliveries. Bring your steel needs or problems to Ryerson for prompt, intelligent cooperation. Phone your nearest Ryerson Steel-Service office. (See advertisement below.)

Whenever Steel is Needed..

In peace and war, in good times and bad—year-in year-out for a century—Ryerson stocks of steel have been American industry's prompt, dependable source of supply.

Today, war production requirements come first—but Ryerson is serving, too, the needs of other essential industries from which flow the goods that feed, clothe and house the nation,—that supply its power, its minerals and other raw materials—all part and parcel of the mighty war endeavor.

The two-fold Ryerson function is to supply steel where needed, without delay—and to aid in the most effective, intelligent use of that steel in every way that experience and skill can suggest.

Wartime demands have made inroads in Ryerson stocks, but Ryerson resources are at your command, to assist you in meeting any problem of steel supply or application.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

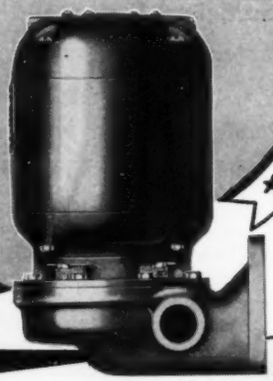
RYERSON

Production too Vital . . Metals too Essential . .

to risk the waste of both, because of faulty lubrication or cooling.

YOU CAN DEPEND UPON PIONEER PUMPS

PIONEER ENGINEERING and MANUFACTURING CO.
19651 John R. St., Detroit, Mich.



Pioneer Pump Model VBA—one of the newest developments—compact—streamlined—designed to operate with low water level out of reach of other pumps.

This is one of the 350 Pioneer Models. There is a size and type to meet your particular lubricant or coolant requirements.

NEW BOOKS

GETTING THINGS DONE IN BUSINESS—*By Everett B. Wilson, director of Porto Rican Trade Council. 287 pages. Published by the McGraw-Hill Book Company, 330 W. 42 St., New York.* $2.50.

Certainly now is the time to get things done, particularly in business, when business is charged with the responsibility of producing war materials. Mr. Wilson's book is not primarily a production book. Most of the points he makes and the cases upon which they are based are in the fields of selling and marketing.

However, as the author points out, human nature is much the same whether it is in the shop or in the sales force. Many of the appeals that are used in successful selling may find application in boosting production.

This volume concerns itself primarily with the problem of getting instructions and ideas carried out. For this ultimate goal various stimuli are suggested in order to enroll the cooperation of the man in the field.

MOLDING TECHNIQUE FOR BAKELITE AND VINYLITE PLASTICS: FOURTH EDITION—*226 pages. Published by Bakelite Corporation, Department T, 30 East 42 St., New York.* $3.50.

This practical manual on plastic molding, formerly published for limited distribution only, is now offered for general sale. It consists of working data on molding technique conveniently indexed for ready reference. The text is devoted to such topics as molding principles, design of molds and products, molding plant layout, heating media, accessory equipment, molding plant cost accounting and a number of other headings. It also includes, as reference matter, tables frequently used in molding practice.

Because of the rapid changes in molding technique, the present edition has been brought up to date. The volume represents the combined effort of the Bakelite Corporation and the Plastics Division of the Carbide & Carbon Chemical Corporation.

TO THE EDITOR

Too Much Ritual

DEAR SIR:

I've heard so much talk recently about the complacency of the American people in the war that I have to let off a little steam. It's not about the complacency of the people but the smugness of the Army and Navy officials who are *pretending* to be in such a big hurry about getting war materials. If the rest of the country is doing no better than what I have seen in this area then the outcome of this war is a

In Grinding

DON'T OVERLOOK THIS VERY IMPORTANT FACTOR!

Stuart's CODOL
Liquid Grinding Compound

100% grinding efficiency is best accomplished by careful consideration of the grinding fluid factor. The vital part which a properly applied, specialized grinding lubricant plays is too often overlooked. It can mean unnecessary sacrifice in quality of finish production speed, and cost of wheels.

These handicaps can frequently be eliminated by going over your grinding problems with a STUART OIL Engineer. His highly specialized experience in the application of modern grinding fluids will help you secure top efficiency.

ASK FOR this informative booklet. Free working sample upon request. Please send your name on Company Letterhead.

For All Cutting Fluid Problems
D. A. STUART OIL CO. LIMITED
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Warehouses in All Principal Metal Working Centers

foregone conclusion—and it won't be in our favor.

There is too much ritual for a plant to go through to get an anti-aircraft gunmount past the inspectors—inspectors who in a good many cases are just operators (not good ones at that) converted in the emergency. Not only must they Magnaflux a joint after every few passes of electrode but the inspector has the option of calling for as many as 35 X-rays on a mount. This work is being done by manufacturers who have built up a pretty good reputation for quality of welding work turned out on commercial equipment in normal times.

In addition to this I see 37-mm. antitank gun mounts being welded and then the welds being ground with ½-in. diameter grinding wheels because the specifications call for it. It takes ten times more time and labor to do this grinding than it does to do the welding—and as far as I can see it doesn't do one bit of good as far as the final operation of the gun is concerned.

I also see machine gun mounts with tolerances so close on the machine screw parts that no commercial shop can meet them, and even then parts made in one plant are not interchangeable. They have to finally assembly the mounts by the "cut-and-try" method—*and they want production.*

The bogie-wheel job takes the prize. One manufacturer has done a pretty good job of training operators to do this work. Naturally their first efforts were not brilliant, but they did a commercially acceptable job. The inspector turned them down for spatter and in some cases just appearance. It was pointed out to him that there was probably five times as much welding on the job as was needed and that probably MacArthur would be glad to get some tanks with any kinds of wheels just so they worked. His rejoinder was that the Army could not be expected to be penalized because of "inexperienced" workmen.

On a boat job, the inspector held up the job for a week because he insisted that the electrode the builder was using was not the right rod for welding mild steel. It was. It turned out that he didn't even have the right specification book. On this same job the builder was building the keel in sections laying them on their sides and using ¼-in. rod to weld the stiffeners. The inspector decided that the job should be welded in position using $\frac{5}{32}$-in. electrode on the vertical welds made necessary by this procedure. He threatened to refuse to pass anything if they didn't do as he suggested. In this case, as in others, the manufacturer has been afraid to go to bat with these men for fear they will make things nasty on everything, slow down production even more and cause them to lose a lot of money.

It isn't complacency on the part of the people, but just plain foolishness on the part of the leadership in the war effort that is going to ruin us.

WELDER

See Our Exhibit
A.F.A. CONGRESS
CLEVELAND
April 22-24

Make man-hours and man-power count more effectively—get more production every hour of the 24-hour working day. Put Standard Conveyors to work—let them do the transportation in your plant—provide for a smooth, uninterrupted flow of materials and parts from receiving platform to machines—department to department—assembly or packaging lines to shipping floor.

Standard Conveyor engineers can help you plan and install conveying equipment in your plant that will speed production—relieve costly congestion of work in process—accelerate the production pace all along the line.

Booklet Shows Variety of Conveyor Applications and Possibilities:
Send for booklet AM-4 "Conveyors by Standard"—a valuable reference book on conveying and conveying methods—contains many installation pictures representing practically all industries—suggests best types of conveyors to use for particular applications.

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General Offices: North St. Paul, Minn.
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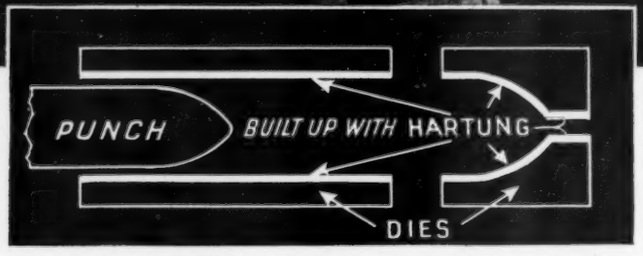
FIRST FOR FASTER PRODUCTION
"THE STANDARD OF VALUE"
Standard CONVEYORS

HOW P&H "HARTUNG" HELPS MAKE SHELLS



Used to Hard-Surface Forming Dies

IN the forging process used to make shells for these 75 mm., 90 mm., and 105 mm. guns, steel bars are passed through a series of dies to form the outer surface of the shell. A punch or piercing die forms the inner cavity — as shown by sketch at right.

For hard-surfacing these dies, P&H "Hartung" has been extremely successful. After the "build-up" with this tungsten molybdenum electrode, dies are heat-treated at 1250° F. This reduces their hardness to 45-50 Rockwell "C", making the surface machineable with Carboloy tools. The deposited metal, free from pin holes, assures smoother finish, reduces wear and materially increases die life.

P&H "Hartung" is also widely used for building up tool steels. With air hardening properties in excess of 60 Rockwell "C", it maintains a durable cutting edge. It is but one of the complete line of P&H Alloy Electrodes. Write for full information.

P&H FOR ALLOY ELECTRODES

P&H-HANSEN SQUARE FRAME WELDERS *give you easier, more accurate current control with one simple adjustment whether machines are used singly or hooked up in parallel, to meet every welding need. . . . Write for Bulletin W-28.*

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Aircraft builders know the magic of Masonite* Die Stock

Putting the finishing touches on wing rib forming die of Masonite Die Stock at the Glenn L. Martin plant.

SPEED is the word for victory today—speed in getting warplanes from blueprint to blue sky!

Aircraft builders are cutting precious hours off production time by the increasing use of the new Masonite Die Stock in the manufacture of dies for forming sheet metal.

Easy to handle—it has only one-sixth the weight of steel—there is no need for cranes or special equipment in transporting or installing dies made of this material as would be the case with metallic dies. This modern, semi-plastic material produces a type of die which does not scratch the metal or cause surface imperfections.

With stiffness and strength for production runs —yet easily handled by pattern or tool maker— Masonite Die Stock is giving aircraft and other manufacturers an all-around economy of time, money and effort.

Masonite Die Stock is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further details, fill out and mail coupon below.

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MASONITE CORPORATION *Dept. AM-41, 111 West Washington St., Chicago, Ill.*

Please send me illustrative literature and complete information about the new Masonite Die Stock.

*Name and firm*_____

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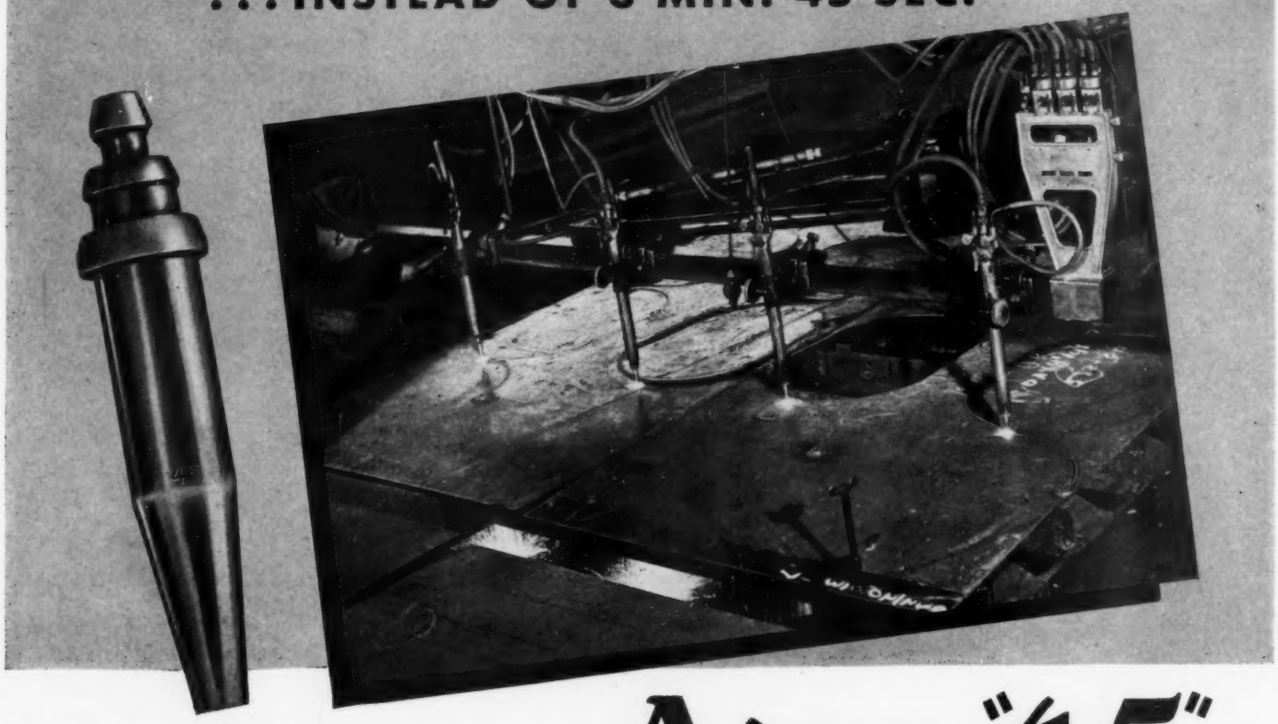
Now 4 cuts in 2 min. 42 sec.

. . . INSTEAD OF 3 MIN. 45 SEC.



USING THE NEW Airco "45"

HIGH SPEED MACHINE CUTTING TIP

At this plant, an Airco Travograph is flame cutting four identical shapes, 77″ in periphery, from 5/16″ steel plate in 2 min. 42 sec. — with the new Airco "45" High Speed Machine Cutting Tips.

1 min. 3 sec. — this is the saving in time now made possible by the Airco "45" in this multiple cutting operation, which until recently required 3 min. 45 sec. with conventional tips.

Airco "45" was developed to bring you maximum cutting speeds — at a time when speed became essential to the country's war efforts. It increases the speed of machine gas cutting by 20 to 30% — without sacrifice in the quality of the cut *and with no increase in oxygen consumption.*

If your plant is engaged in war production and utilizes Airco oxyacetylene machines for cutting steel up to 8″ thick, we urge you to ask your nearest Airco office for further details or to request our 8-page bulletin on Airco "45".

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Anything and Everything for **GAS WELDING or CUTTING and ARC WELDING**

*Like a SABOTEUR in the shipping Room –

*Lack of proper protection... while in transit, or in storage

Faulty packing, insecure wrapping or improper materials can cause as much damage and delay as *deliberate* sabotage. Goods damaged in shipment cost this nation badly needed materials and man-hours of labor. They waste valuable shipping space in train, truck or boat, and their failure at a critical time, when needed most, may prove a disaster.

There's no place, in time of war, for such costly hazards.

That's why FIBREEN is taking its place as an essential material in America's war program. It provides exceptional protection, at low cost, for goods in transit or in storage.

It safeguards the vital flow of materials, parts, and finished goods of war — from mill, to sub-contractor, to assembly line — and to all parts of the country and abroad.

FIBREEN is a tough, waterproof paper, reenforced with two plies of closely spaced steel-like fibres, embedded in two layers of special asphalt, between two sheets of kraft. It's clean, pliable, easy to use — as a wrapping, a lining for crates, and as a superior replacement for fabrics and materials no longer obtainable.

Production of FIBREEN is now being diverted to uses essential to the war program. If your products fall in this class—if you're interested in better packing methods and materials — we will try to help you. Write, explaining what you ship, and how you now pack it.

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1. Gulf Super-Quench imparts the maximum hardness and greatest depth of hardening obtainable by quenching in any except aqueous quenching media.

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A remarkable contribution to the production of war materiel.

HERE is the quenching medium long sought by metallurgists! With a faster cooling rate than any known quenching oil, Gulf Super-Quench has *dual-action:* (1) It has a cooling rate intermediate between oil and water through the hardening temperature range. (2) It retains the slow speed of oil below the hardening temperature range.

Thus Super-Quench makes possible maximum physical properties, yet institutes no more distortion than do ordinary quenching oils—far less than water.

Developed through extensive research in Gulf laboratories, Super-Quench has been proven by service in the

QUENCH

A revolutionary new dual-action quenching oil

field—on many types of steels, and on various shapes. In many instances, quenching with this new medium has resulted in a marked improvement in physical properties.

Gulf engineers are at your service to consult with you on your quenching problems. For further information, write today to Gulf Oil Corporation, 3800 Gulf Building, Pittsburgh, Pa..

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Please send me, without obligation, complete information on Super-Quench, your new dual-action quenching oil.

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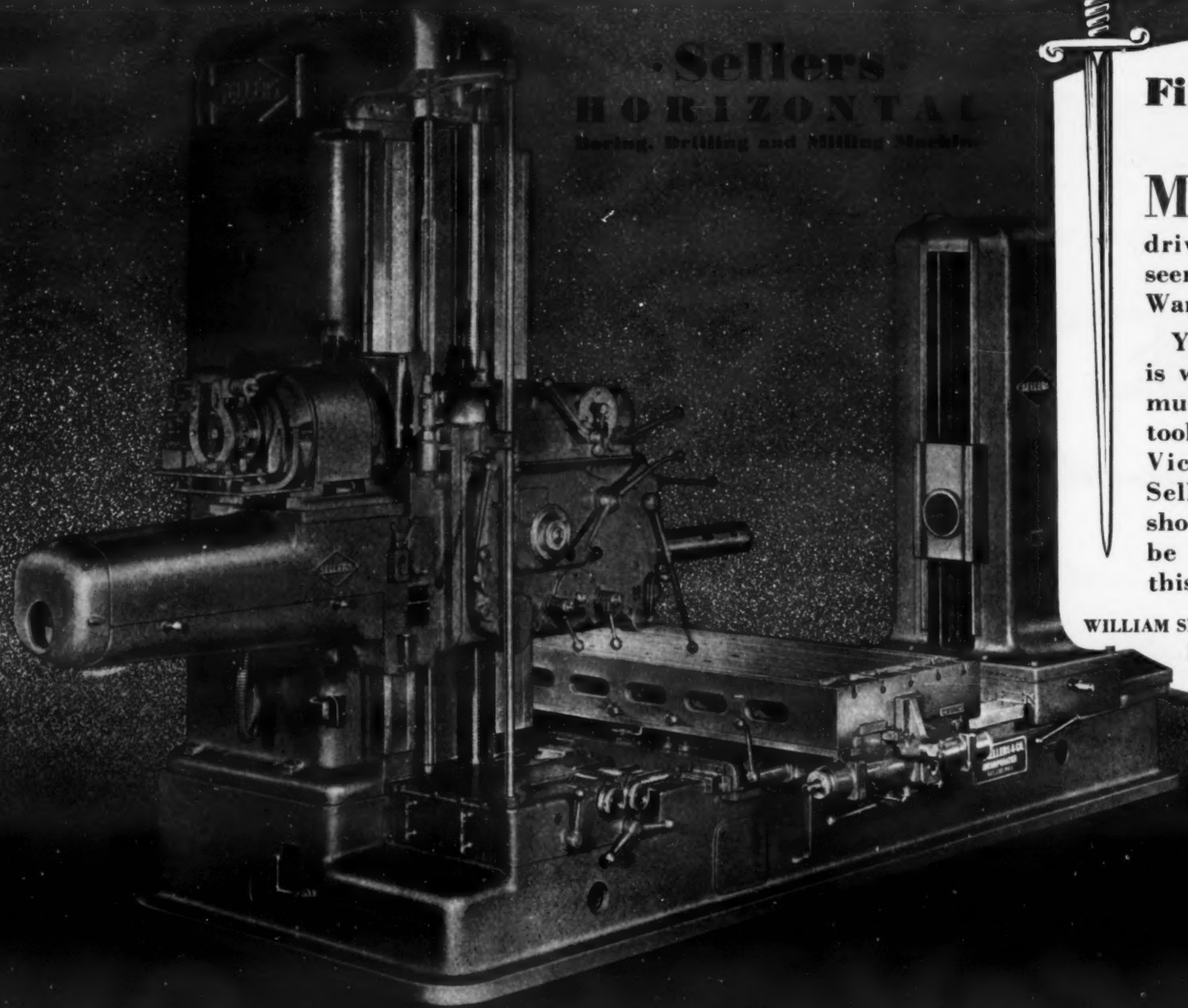

First in WAR—

First in Peace . . . .

Machine tools are playing such a vital part in the drive to Victory that they seem an integral part of the War Machine itself . . .

Yet when the Peace is won and the world must be rebuilt, the tools that have brought Victory . . . like the Sellers 5" Horizontal shown here . . . . will be found ready for this job, too.

WILLIAM SELLERS & CO., Incorporated
PHILADELPHIA

Sellers

FOUNDED SELLERS 1848

VICTORY STARTS HERE!

(Above) Partial view of Oster's enlarged factory facilities for greater production of No. 601 Turret Lathes. Oster plants located in Cleveland, Ohio and Erie, Pennsylvania.

(Below) The Oster No. 601, a SIMPLIFIED bar and chucking machine; power driven; equipped with 6-position, manually operated turret. Two optional drives: WORM drive and DIRECT drive.

● Months before war was declared, demands for the new Oster No. 601 Simplified Turret Lathe were a signal to increase factory space quickly. When the war broke, enlarged factory space was ready to absorb the still greater demands for those versatile bar and chucking machines. *Oster knew that Victory starts with production!*

Batteries of Oster No. 601s are now in action on first and second operation work in diversified war industries. Notable has been the success of those machines used to speed production of 20, 37 and 40mm shells. (Details on request).

Advantages of Oster No. 601 machines are explained graphically in Catalog No. 27-A. *Important memo:* The No. 601 costs less than $2000, without tools. Delivery? *12 WEEKS OR LESS!*

OSTER

Let's GO!

THE OSTER MFG. CO. • 2049 East 61st St., Cleveland, Ohio

Rush, by return mail ..... copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

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ADDRESS.....

CITY..... STATE.....

"SON, YOU CAN BET THERE'S A DIFFERENCE!"

"Any two tools may look alike, young fellow. It's the way they perform on the job that makes the difference."

Old timers in production know — and apprentices soon learn — that all the difference between profit and loss may depend on the efficiency of the tool at the work-head. Morse Tools are made to keep pace with the productive capacities of the newest and finest machine tools.

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NEW BEDFORD, MASS., U. S. A.

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. . . of the distinction of having received these two valued awards from the Secretary of the Navy in recognition of outstanding excellence in the production of cold drawn steels so vital to our National War Program.

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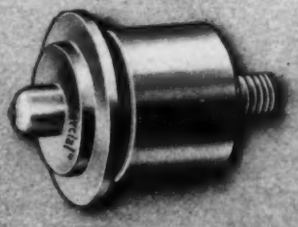

OUR plant is geared to make ball bearings of almost every type and size—to your design and specification, or designed to meet your needs. We illustrate some Schatz "Commercial" Ball Bearings used in coal conveyors, textile winding machines, typewriter desks, etc. Our specialty is the most economical bearing that will perform satisfactorily.

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"Commercial"
ANNULAR BALL BEARINGS

For the smaller manufacturer, many standard types and sizes of "Commercial" Ball Bearings are available. They are used in hundreds of different industries. We can be of service—whether you need a few, or a great many units. Write for catalog.

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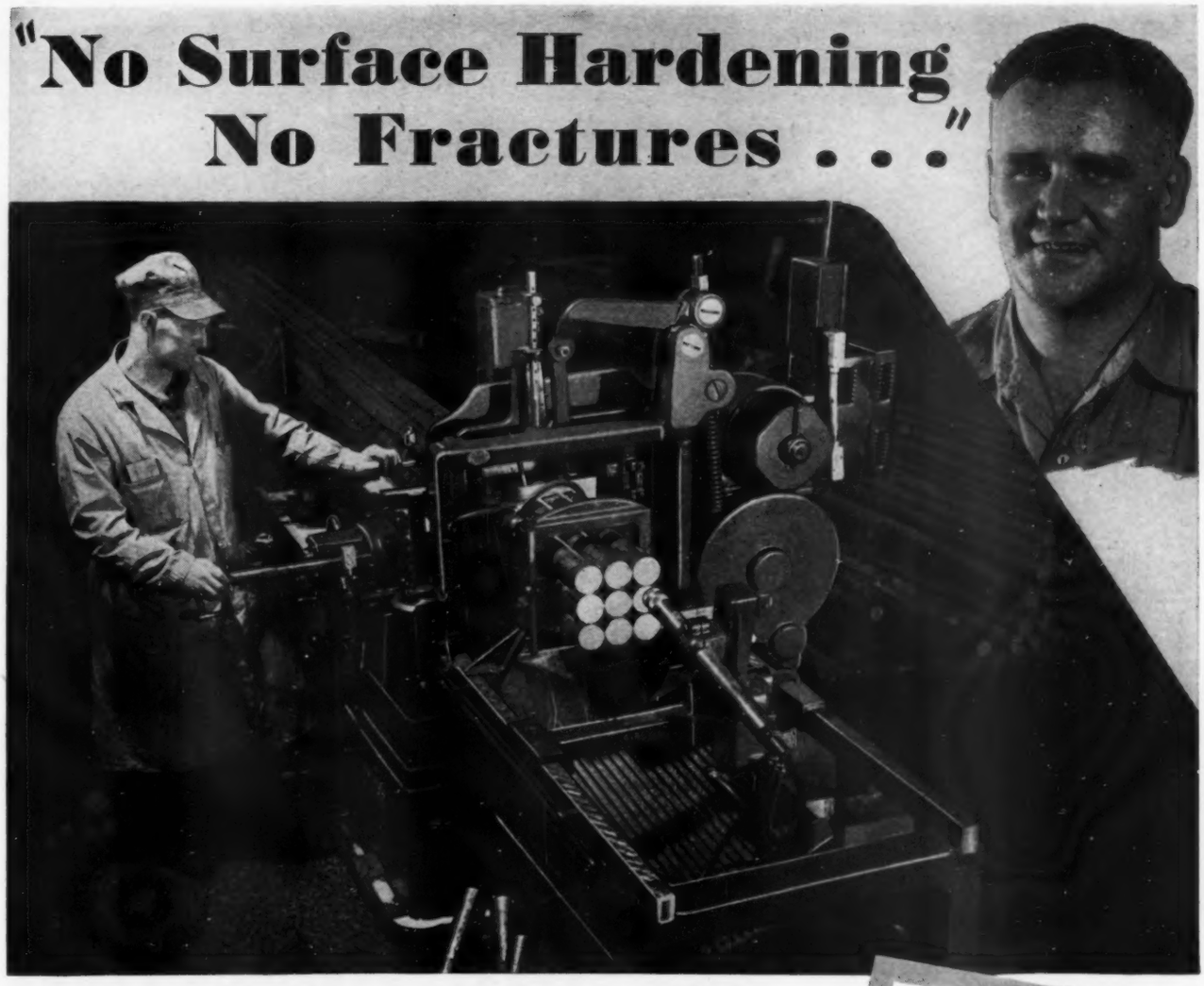
Cleveland Office: 402 Swetland Building

"No Surface Hardening No Fractures . . ."



When The Metal Is SAWED By A Straight-Cutting PEERLESS

Making shells . . . building tanks for the armies of democracy . . . or building tractors for the agricultural front . . . metal must be conserved in every case.

Maximum savings result when metals are SAWED with a straight-cutting Peerless — as little as 1/16" of material is removed by the cool-cutting, long-lasting Peerless blade and there is no danger of surface hardening or fracturing the metal. Even the finest of "steel-dust" is easily and quickly salvaged from the convenient chip tray where it is deposited by the constant flow of the coolant.

And remember — less metal removed means LESS CUTTING TIME — LESS HAUL-BACK TONNAGE for the railroads and LESS RE-ROLL TIME for the steel mill. Find out all about PEERLESS — the Saw with the patented Four-Sided Saw-Frame and Backing-Plate Blade Support. A brief note on the coupon will bring a complete recommendation on any of your metal cutting problems.

PEERLESS MACHINE COMPANY, Racine, Wisconsin

Performance Report "C"

9" x 9" High Duty Peerless with Hydraulic Blade Feed and Automatic Hydraulic Bar Feed cuts off 2½" lengths of 2⅝" square steel—S.A.E. 1050 —at the rate of 9 pieces in 12½ minutes.

Peerless
METAL SAWING MACHINES

PEERLESS MACHINE COMPANY, Dept. AM-442, Racine, Wisconsin

Mail cutting time estimate for.....

☐ Mail catalog on Hydraulic type Saw for High Production Cutting
☐ Mail catalog covering Vertical type used for Die Block Work
☐ Mail catalog on Mechanical type Saw for production cutting
☐ Mail catalog on general utility and maintenance Saws

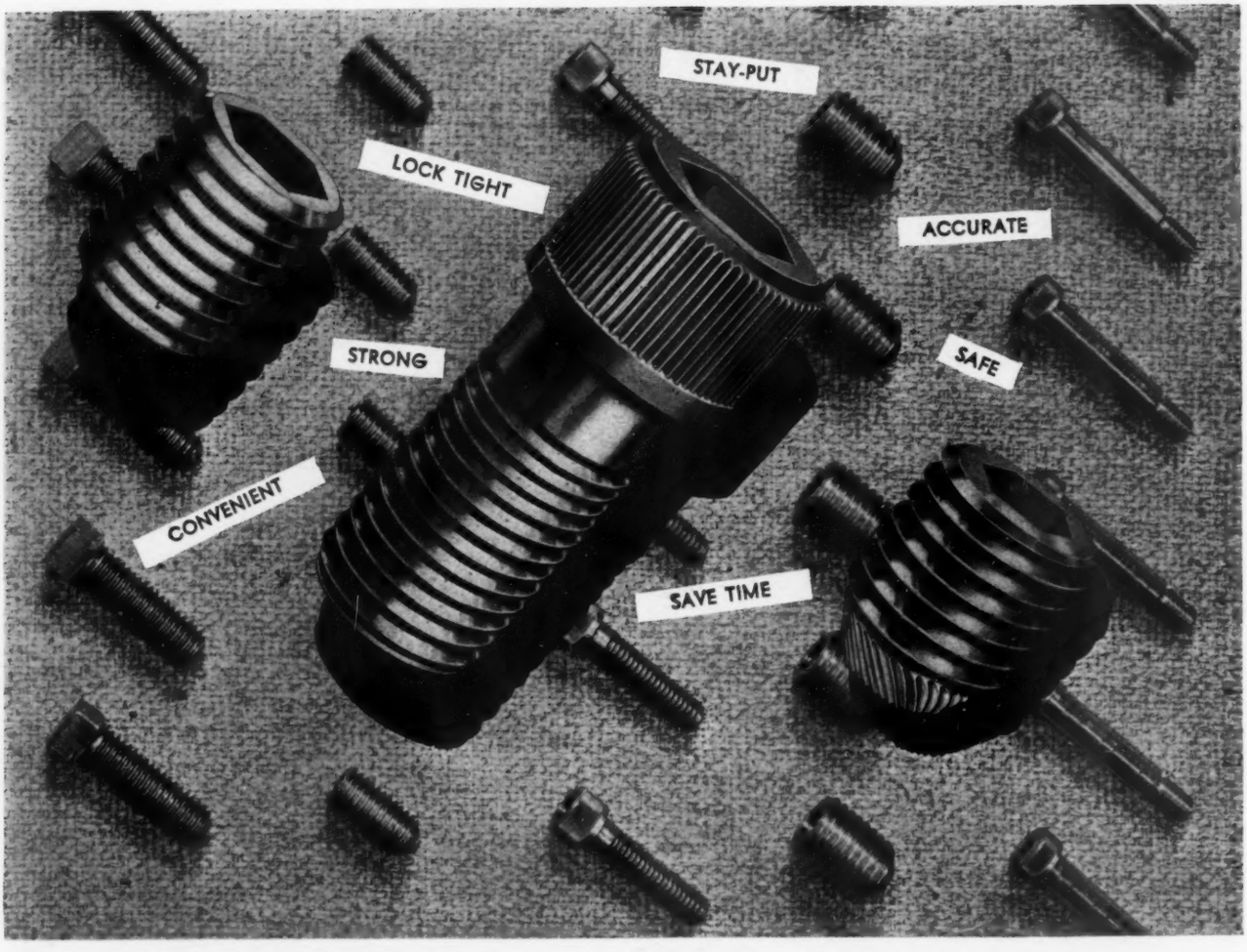
Company.....

Individual.....

Street.....

City.....State.....

FAST, ACCURATE CUTTING DEMANDS POSITIVE BLADE CONTROL



PATTERN for PRODUCTION

Save time with UNBRAKO Screw Products

Each of the above is "Unbrako"—ready to play its part in speeding your production flow. Just as machine tools require patterns, so is the "Pattern for Production" vital—that each part does its bit better.

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA. BOX 4
— BRANCHES —
BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

Thousands of manufacturers have used millions and millions of "Unbrako" Screws throughout the years. The crucible of experience proved to them that "Unbrako" saves time and money—whether in shop work or in the equipment manufactured.

Tell us the purposes for which you use screws. We will be glad to explain how and why "Unbrako" will do your job better.

Knurling of Socket Screws originated with "Unbrako" years ago.

Reg. U. S. Pat. Office
UNBRAKO Screw Products

FOR WAR INDUSTRY METAL WORKING

WELDON ROBERTS

Brightboy

Speeds up Finishing

Saves Precious Time in
DE-BURRING and FINISHING

Quick, Easy, Inexpensive to Use, for
AIRCRAFT ENGINES, FUSELAGES, ASSEMBLIES, PARTS, PROPELLERS. INSTRUMENTS and PRECISION WORK OF ALL TYPES. SHEET ALUMINUM, STAINLESS STEEL and OTHER METALS TO BE SPOT WELDED. MACHINE GUNS, RIFLES, PARTS, SHELL CASES. TANK ENGINES and PARTS

—and countless other finishing requirements of war industries.

TAKES up the work where other finishing tools leave off. Does not conflict with grinding wheels, abrasive cloths, files, pike stones, polishing cloths. AN ENTIRELY DIFFERENT OPERATION FROM A GRIND OR BUFF.

BRIGHTBOY is an ELASTIC RUBBER COMPOUND, IMPREGNATED WITH ABRASIVE. The soft rubber binder cushions the abrasive, giving Brightboy a wide and varied utility. In actual operation, the abrasive is *cushioned* by its soft rubber binder, the abrasive falling free as the resilient rubber binder wears away. Its light action produces a smooth finish, pre-polish or polish on all kinds of metal, with minimum dimensional loss of material.

Made in blocks, sticks, tablets and rods, for handwork; in wheels for use on portable and stationary power machinery—lathes, grinders, polishers and other automatic and semi-automatic machines. Brightboy finishes, polishes, removes burrs, file digs, tool marks, heat marks; restores finish to metals; smooths and cleans soldered and welded joints.

Available to war industries through recognized mill supply jobbers. Write us direct for catalogs and prices if your jobber cannot supply you.

BRIGHTBOY INDUSTRIAL DIVISION • WELDON ROBERTS RUBBER CO. • NEWARK, NEW JERSEY

SPEED PRODUCTION with

The New Repairable Cleco Sheet Holders with Latest Design Pliers

CLECO SMALL RIVETERS

FROM our background of more than 40 years' experience in the pneumatic tool field comes this extensive line of Cleco Small Riveters, especially adapted to today's needs for faster production. These tools strike accurately controlled blows, at the proper speed and power, causing the rivet metal to flow uniformly without structural deterioration. Their use insures tight rivets, and avoids damage to the metal being riveted.

An outstanding feature is the position of the air inlet on the barrel side of the handle. This permits the hose to fall away straight.

Cleco Small Riveters include both "slow hitters" (up to 2500 blows per minute) and "fast hitters" (from 2500 to 5000 blows per minute). Both types are available with several styles of handles, made of either steel or aluminum. Because the line is so extensive it contains exactly the *right* tool for every job. You can select a tool sufficiently powerful to drive the rivet in a small number of blows, thus obtaining well driven rivets and saving time and labor.

For complete information on Cleco Small Riveters, ask for Bulletin 85. Profusely illustrated it describes the line in detail, contains useful specifications and charts.

The complete line of Cleco Pneumatic Tools includes chippers, riveters, sand rammers, drills, grinders, valves, Bowes Couplings and accessories.

THE CLEVELAND PNEUMATIC TOOL CO.

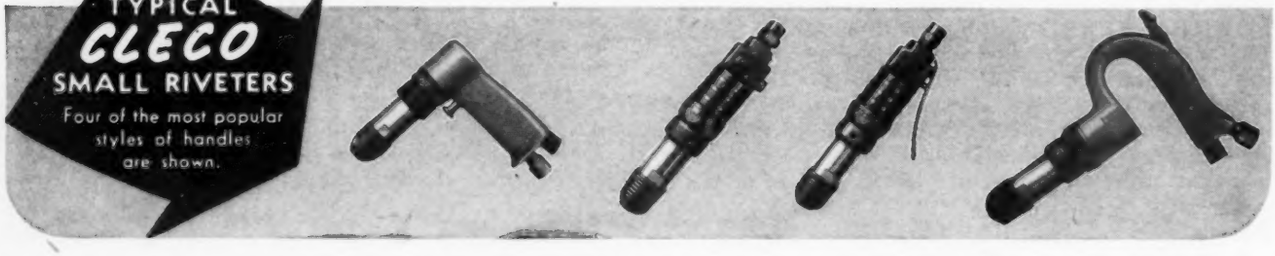
3734 EAST 78th STREET CLEVELAND, OHIO

Branches in All Principal Cities

★ ★ ★

TYPICAL CLECO SMALL RIVETERS

Four of the most popular styles of handles are shown.



ASSIGNMENT: *Victory*

● American industry is today charged with the greatest responsibilities in history.

★ ★ ★

Built into every National Cutting Tool is a full measure of our share of these responsibilities.

NATIONAL

NATIONAL TWIST DRILL & TOOL CO. DETROIT U.S.A.

TWIST DRILL AND TOOL COMPANY

Home Office and Factory—DETROIT, MICH.

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

F YOU
EQUIRE

Impact Resistance

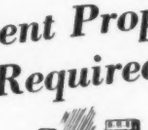
CIRCUIT BREAKER HOUSING '40
molded from a *general-purpose* BAKELITE *Phenolic* Plastic, represented sound designing and engineering. For ordinary industrial service, it fully met the need for high dielectric strength, moldability, and resistance to moisture, corrosion, and wear. *But—*

BAKELITE PLASTICS · MATERIALS PROPERTIES

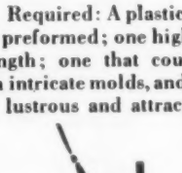
BAKELITE PLASTICS · FABRICATION METHODS

BAKELITE PLASTICS · RESEARCH DATA

Different Properties Required



1940 Required: A plastic that could be easily preformed; one high in dielectric strength; one that could be employed in intricate molds, and providing a highly lustrous and attractive finish.



1942 Required: A plastic housing that, under test, would withstand the shock from the blow of a one-ton weight crashing into the wall behind it! Preformability, surface finish, and other properties subordinated to maximum toughness and shock resistance.

For help in determining the
RIGHT *Plastic Material*
RIGHT *Mold Design*
RIGHT *Fabricating Technique*
enlist the aid of
Bakelite Plastics Headquarters

3 WAYS
BAKELITE PLASTICS HEADQUARTERS
can help you to
speed up production while conserving
valuable, strategic materials

BAKELITE
TRADE-MARKS

IN PLASTICS

You will be interested in this story of two Circuit Breake Housings molded from different "Bakelite" Plastic

CIRCUIT BREAKER HOUSING '42

had to be molded from a different plastic, *a high-impact* BAKELITE *Phenolic* material, because today's service conditions, for example, aboard a warship, are greatly different from those encountered in 1940. Toughness and shock resistance are now the vital factors in plastics selection.

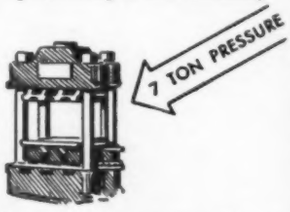
★ *A Different Material Specified*

1940 Typical material used was a general-purpose, cellulose-filled BAKELITE Phenolic plastic. Bulk Factor, i.e., the ratio of the volume of molding material to the volume of the finished piece, is 2.5 to 1, and molds were built accordingly.

1942 The highest ranking shock-resistant plastic is demanded. Bulk Factor is 8 to 1 so that molds built previously are too shallow to accommodate the impact-type material, *even though the design of the finished piece has not been altered.* New molds are necessary.

★ *Molding Technique Modified*

1940 Molding pressure averaged 2,000 pounds per square inch. This comparatively low pressure minimized the danger of shearing-off pins. Material could be preformed thus simplifying the problem of filling-out "hard-to-get-at" corners. Flow ranged from "soft" to "very soft" permitting a fast molding cycle.



1942 Molding pressures range from 8,000 to 14,000 pounds per square inch. Molds have to be built sufficiently strong to withstand these considerably higher pressures. The material is not preformable. Because flow is "extra hard," allowances must be made in designing the mold to provide proper fillets and tapers.

★ *Plastics Research Data and Engineering Guidance*

Because no two plastics problems may be exactly alike, it is recommended that designers and engineers draw upon the knowledge and data accumulated by Bakelite Plastics Headquarters in more than 32 years' experience with plastics development and application. Here you will learn the essential differences between thermosetting and thermoplastic materials, and the fabricating methods required to convert these plastics into finished parts. Here you will learn the "Do's and Don'ts" of materials selection, mold design, and other vital factors that are so essential to satisfactory plastics performance.

1 LITERATURE *on "Do's and Don't's" of Plastics*—Helpful, technical booklets containing data on the various types and forms of BAKELITE Plastics, and the most economical and effective methods of fabrication. This literature will assist you in selecting the proper plastic for a given job, will save your time, and help you to avoid errors.

2 GEARING *our Laboratories to Yours* Bakelite Laboratories offer a two-fold service. They are ready to help you utilize present plastics in current strategic production. And, they will also develop new formulas to help solve the problems created by highly specialized applications.

3 FIELD WORK *on "Frontline" Jobs* Located at important industrial centers throughout the Nation, Bakelite Field Engineers are readily available to give prompt service to manufacturers engaged in Defense Production. These engineers are fully qualified, and frequently may be able to solve production problems right on the spot.

Plastics Headquarters

The word "Bakelite" and the Symbol are registered trade-marks identifying products of Bakelite Corporation

BAKELITE CORPORATION
Unit of Union Carbide and Carbon Corporation
30 EAST 42nd STREET, NEW YORK

UCC

A Quick, Smooth, Uniform coating — assured by

BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With these new Barrett machines for expelling excess metal from small parts after dipping in molten metal, faster and better work is assured which will pass the most rigid inspection for quality.

The method of handling work is simple and easy. Work to be processed is placed in a basket and submerged in a kettle of hot molten metal. When thoroughly heated, the basket with the work is transferred into the Barrett Centrifugal where the basket is revolved and the excess metal thrown from the work. A quick pick up and stop (from 2 to 3 seconds each) assures fast work. Then too, quick pick up snaps the excess metal from the work before centrifugal action comes into play. With Barrett Equipment excess molten metal can be quickly thrown off before the metal cools, thereby assuring smooth, even thickness of coating.

Barrett Centrifugals for Galvanizing with and without heated drums are available in capacities from 40 to 240 loads per hour handling from 5 to 100 lb. loads. For tinning, Barrett offers the #0 Centrifugal Machine, operated similarly to the Galvanizers. On threaded work, tinning is so exactly done that rethreading is unnecessary.

Barrett Galvanizers, combining convenience of operation with the utmost in speed and safety are developed to meet the requirements of actual use by men thoroughly familiar with this class of work. They are self-contained and occupy the minimum of floor space.

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

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urges every Purchasing Official to *center* his buying activities in the local Distributor; to *concentrate* his purchases in the channels specially organized for mass buying and supplying; to *reduce* small order-chasing by the manufacturing supplier; to *simplify* handling and shipping . . . to *speed* deliveries! Your Distributor unifies the demand by acting as COLLECTIVE PURCHASING AGENT for his locality.

THE ALLEN MANUFACTURING COMPANY, Hartford, Connecticut, U. S. A.

PERKINS
Custom-cut GEARS

. . . *for quiet, efficient power transmission*

Let Perkins show you the economy of using long-lived, trouble-free Custom-Cut Gears, made by Perkins to your specifications.

Perkins small and medium sized gears can be depended on for strength where strength is needed. If accuracy is paramount. Perkins assures precision—always the right gear for the maximum in performance. service and efficiency.

Write for a Perkins estimate on your gear requirements.

PERKINS MACHINE & GEAR CO., 110 CIRCUIT AVE., SPRINGFIELD, MASS.

BRAWNY GEARS

PROMPT
ECONOMICAL SERVICE
ALL TYPES, MATERIALS
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Ask for Estimate

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FINE GEARS of All Types and Sizes

Spur Gears—½ in. to 30 ft. in diameter
Bevel Gears—½ in. to 13 ft. in diameter
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Worm gears in any practical size

THE EARLE GEAR & MACHINE CO.
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EARLE GEARS

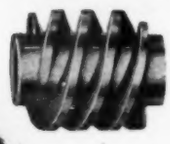
BEVEL GEAR RATIOS

can be changed by merely changing the pinion.

BILGRAM

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

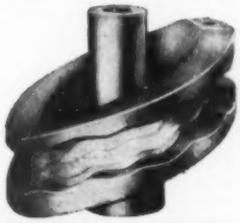
"HARTFORD" for Gears, Cams, Thread-Grinding



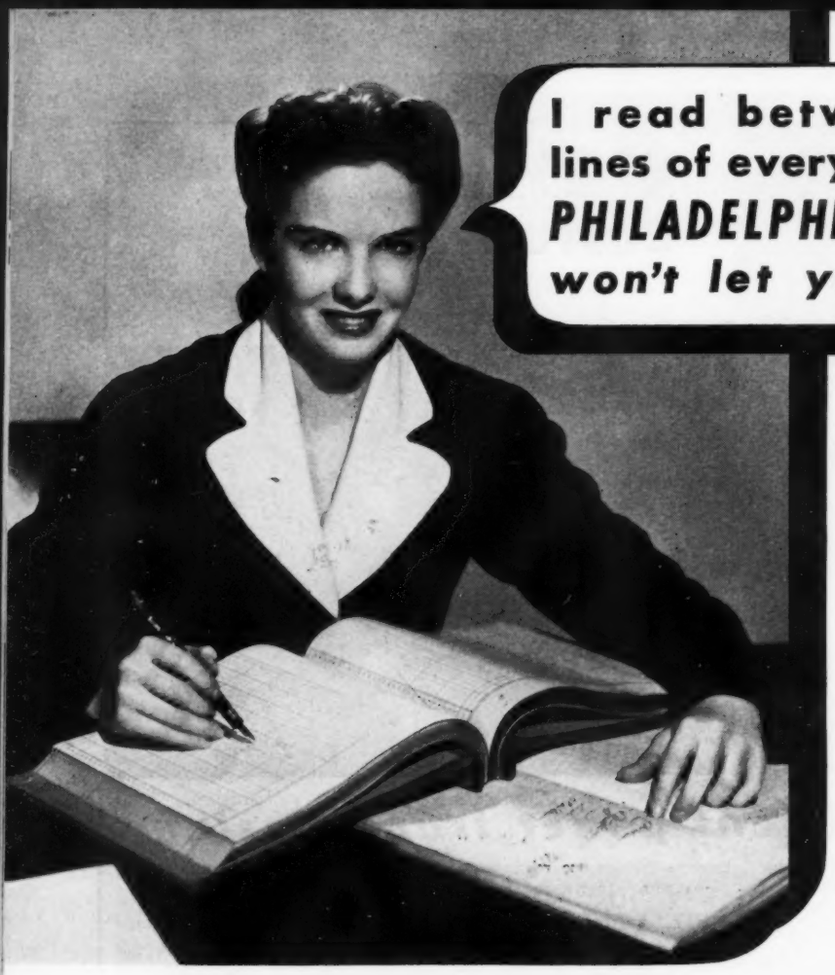
OUR SERVICE INCLUDES:

. . . cutting gears of every description exactly to specifications
. . . grinding gears, cams and threads
. . . furnishing aeronautical parts on a contract basis

You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.

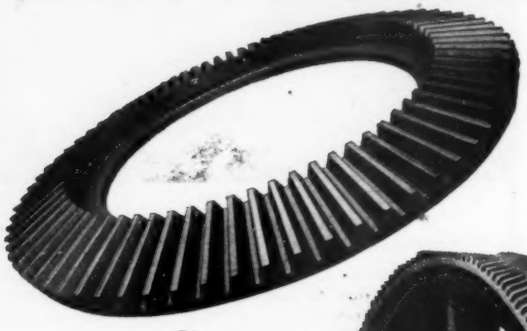


THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.



I read between the lines of every entry... PHILADELPHIA GEARS won't let you down

Be Sure . . .
Specify Philadelphia



For 50 years plants in all lines of industry have been ordering and re-ordering Philadelphia gears of all types knowing that their high quality and expert workmanship would provide smooth, efficient operation and long service life. This high quality is more important than ever today when production must be maintained at top speed . . . when needless breakdowns cannot be tolerated.

You can get the right gear at Philadelphia for we make all types, in all industrial sizes and all available materials. Our Gear Catalog is a valuable aid to every gear buyer. Send for a free copy today.

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INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA, PA.
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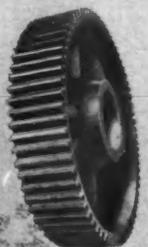
Philadelphia
LIMITORQUE CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.



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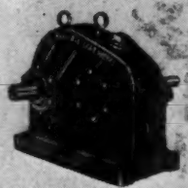
GEARS
All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia
WORM GEAR SPEED REDUCER
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

Philadelphia
MOTOREDUCER
The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.



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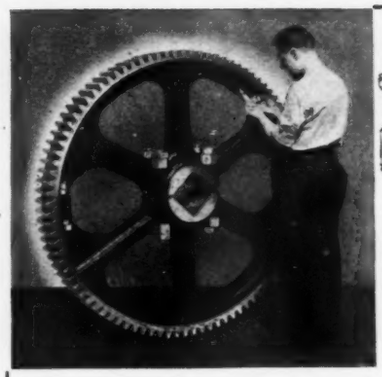
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.



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WELL-BUILT *Gear*

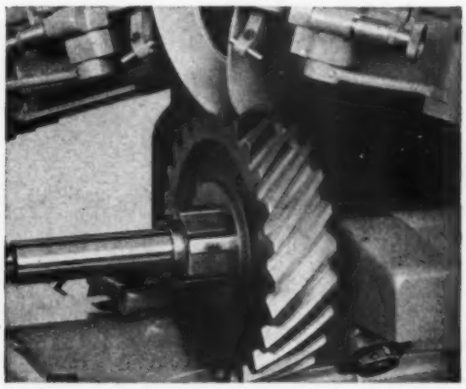
Ability to handle those big, difficult, out-of-the-ordinary gear jobs with ease means that it's just plain horse sense that Stahl can go to town in meeting ordinary requirements.

However, Stahl gives the same careful attention to all specifications for gears, large or small. Our modern facilities enable us to produce many types of gears and of any material—AT PRICES WHICH WILL INTEREST YOU.

Just send us blue prints or specifications of the gear or gears you require. Ask us to quote. You'll find that Stahl will save you money as well as serve you efficiently.

STAHL GEARS

THE STAHL GEAR & MACHINE CO.
CLEVELAND OHIO



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Cut and ground on Maag Machines in our Jersey City plant to an Accuracy

of Profile up to	.00012"
of Pitch up to	.00024"
Eccentricity of pitch circle	.00060"

Or Gears cut to usual standards without grinding

SWISS-AMERICAN GEAR MFG. CO.

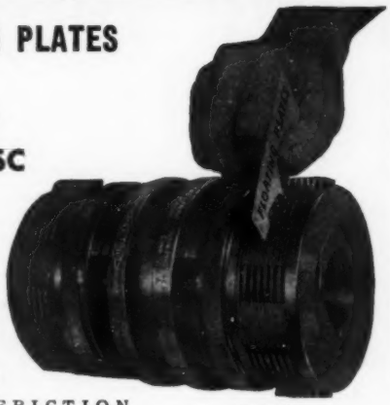
5003 Chrysler Bldg., New York, N. Y.

THE JOHNSON FRICTION CLUTCH

HAS FLOATING PLATES

THE NEW "MAXITORQ" MULTIPLE DISC DESIGN.

...for better clutch performance under ANY CONDITIONS



Double "Floating Plates" in neutral

Single

More than thirty years of successful application of JOHNSON FRICTION CLUTCHES to practically all power transmission demands is behind every recommendation made by our Engineering Department.

You can, therefore, depend on better clutch performance regardless of the severity of operating conditions, when you bring your clutch problems to JOHNSON Engineers for study.

Among the operating features which contribute to better performance are sensitive starting, safety, cleanliness, quietness, efficiency and long life.

You incur no obligation in asking us to show specifically how you can improve power transmission on your machines. Just give us the details of your problem.

Write for Multi-Disc Clutch Catalog No. 41 or Consult "Sweet's" or "Thomas' Reg."

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

CINCINNATI GEARS *for* TOP PERFORMANCE 24 HOURS A DAY... *Every Day!*

All Cincinnati Gears are made for continuous . . . all out . . top performance. Industry . . thru long experience, knows Cincinnati Gears will stand up under continuous pressure twenty-four hours a day . . . every day.
Our forty years' experience in making gears for industrial requirements is always at your service . . . you may find this particularly valuable

THE RIGHT GEAR FOR THE JOB...

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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"From the smallest Gear up to 72" diameter.

"Whether your drawings call for standard or special Gears, you will find Grant Gears will give you the high efficiencies and economies that present-day requirements demand."

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SPURS—SPIRALS—BEVELS—WORM GEARING

(14 to 96 D. P.)

With considerable experience and exceptional facilities for the manufacture of high precision Small Gears, our manufacturing capacity is now heavily burdened with National Defense work, and we naturally feel pardonable pride in the importance and quality of our contributions to the Program.

While this very essential work takes precedence, we are keenly conscious of our *duty* to *established* customers; their needs must command our continued earnest efforts. Under such circumstances, we hope new inquirers will understand our inability to give their wants the consideration they would ordinarily receive.

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GEAR CUTTING MACHINES

New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
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MP **QUALITY GEARS CUT TO ORDER** MP

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

MP **MEISEL PRESS MFG. CO.** MP
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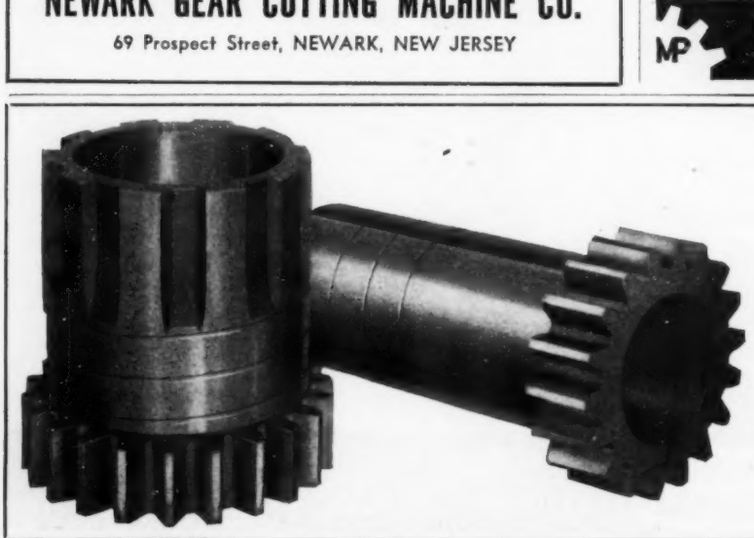

ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
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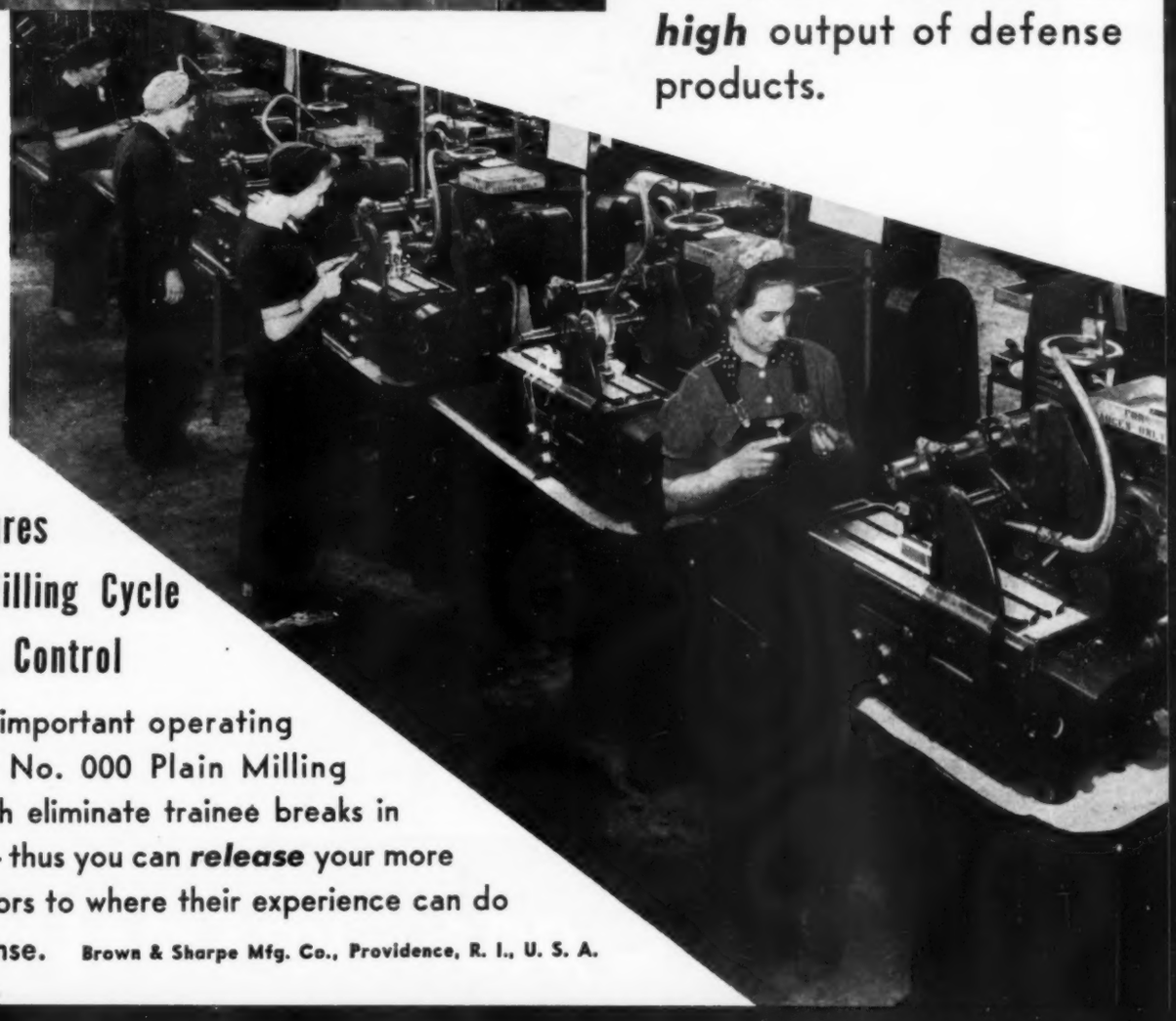
No. 000's Consistent Output

SPEEDS PRODUCTION ON SMALL PARTS MILLING

New operators learn quickly the simple operation of these productive machines — and maintain ***high*** output of defense products.

For Urgent National Defense Production . . . Today

B·S



✓Safety Features
✓Automatic Milling Cycle
✓Push Button Control

— These are important operating helps of the No. 000 Plain Milling Machine which eliminate trainee breaks in production — thus you can ***release*** your more skilled operators to where their experience can do most for defense. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

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OF POWER FACILITIES

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2 Morse Silent Chains
3 Morse Indexing and Free-Wheeling Clutches
4 Morse Silent Chain Couplings
5 Morse Morflex Couplings

DEPEND ON

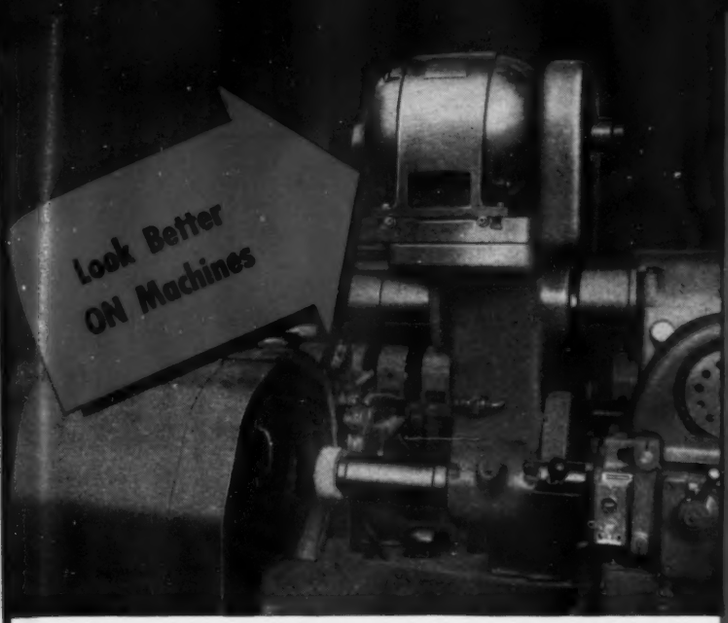
MORSE DRIVES

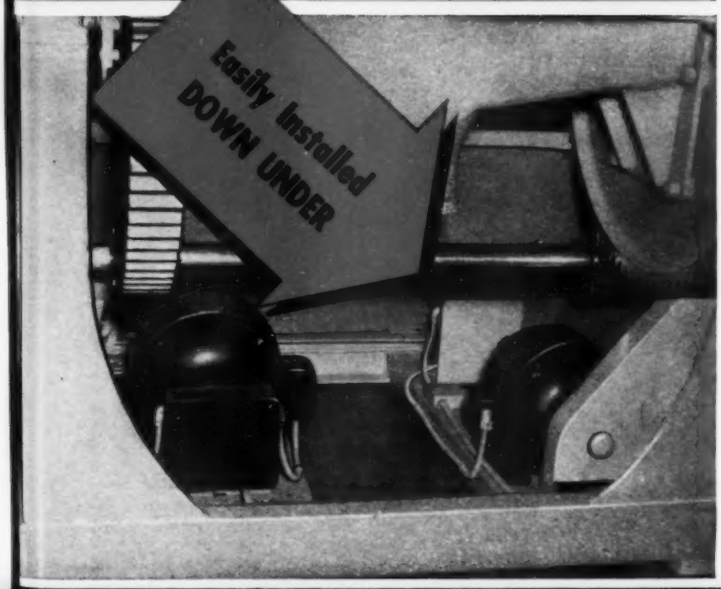
In these days of "all out" production, the job of efficient, dependable power transmission becomes extremely important. Power loss through inefficient drives can seriously effect your production schedules. Insure against production set-backs by transmitting all the power with Morse Drives. Regardless how large or small your drive requirements may be—Morse Drive equipment will meet your needs more efficiently and economically. Morse Silent and Roller Chains have many exclusive features. They deliver at 99.4% efficiency. Don't overlook the many advantages of Morse Silent Chain and Morflex Couplings. They are dependable, long lasting and have proven themselves worthy in hundreds of different installations under the most severe conditions. Morse Indexing and Free-Wheeling Clutch Couplings are ideal for indexing and free-wheeling purposes—available in many sizes. You will profit with Morse Drive equipment—consult the Morse man in your territory—today.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.





TRI-CLAD

REG. U.S. PAT. OFF.

MOTORS

SIMPLIFY THE JOB

of designing or building machines

Note how the smooth, trim contours of Tri-Clad motors will blend with the modern appearance of your machines.

They can be mounted in exposed locations close to cutting tools because their sturdy, cast-iron frames and end shields give them *extra* protection against physical damage from chips and spattering coolants.

Their compactness is a valuable asset when your design allows only limited space for the motor drive, or when the reduction of shipping weight means money saved.

Tri-Clad motors are a cinch to install. Primarily because of the shape of the bearing housings, they are easily handled by hand or with slings. Their roomy conduit boxes give ample wiring space, and all leads have terminals and are clearly identified. Their end-shield design permits mounting horizontal types in any of four positions.

In addition, all Tri-Clad rotors are dynamically balanced as one important step in their manufacture to facilitate over-all operating smoothness of machine and motor.

While the standard, open type (now available to 100 hp) will meet a wide range of design requirements, Tri-Clad motors are also available in splashproof and vertical types with face- or flange-type end shields. Ask your G-E representative about types and ratings. *General Electric, Schenectady, N. Y.*

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

IF JUST ANY GOOD MOTOR WILL DO

Please Don't Come to Us

If your requirements go no further than good standard motors, we say frankly, Welco Motors are not for you.

There were days not so long ago when our company was glad to fill your standard orders. There may be a time soon again when we can work with you on this type of business — we sincerely hope so.

Right now, we feel that our most valuable contribution can be made on custom torque motor work. Our engineering experience and our highly specialized production equipment are tuned to the task of making a specific motor to do a specific job. If your motor problem is just a little bit tougher than ordinary, if you have need for custom service, give us the facts. We'll be glad to lend a hand.

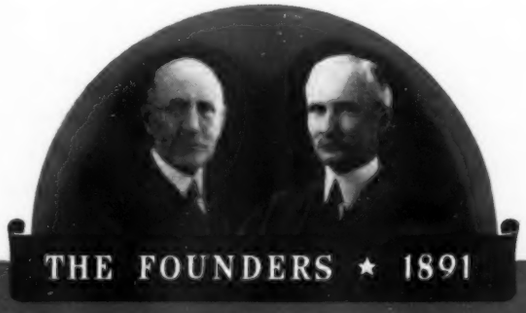
THE B. A. WESCHE ELECTRIC COMPANY

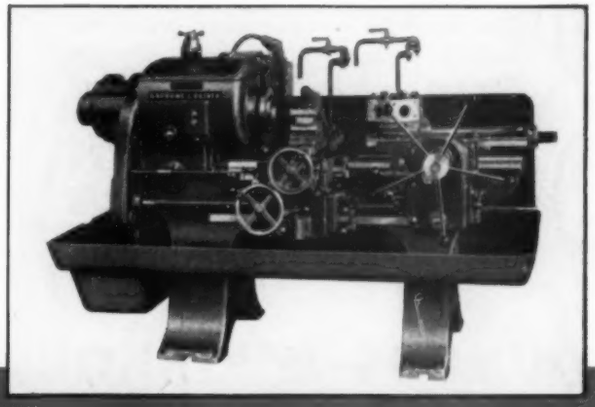
1628 Vine Street Cincinnati, Ohio

The Turret Lathe *for Tomorrow*

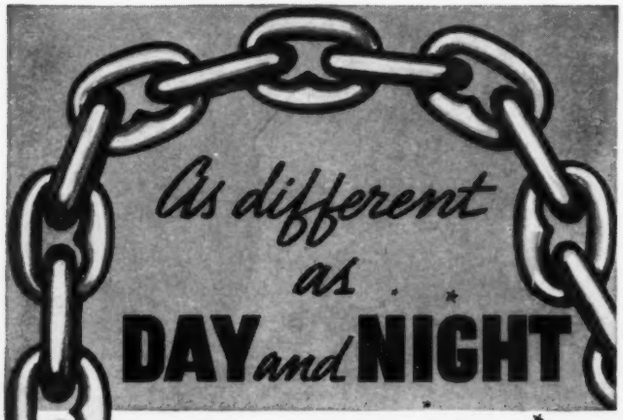
Far sighted executives are looking foward tomorrow when specifying tools for today's emergency production. The profits in the years of tough competition ahead will require machines that are still accurate and that retain their high productive capacity.

The life long accuracy built into Bardons & Oliver turret lathes is essential for efficiency in the years to come as well as for interchangeable manufacturing of planes, tanks, and guns at the present time.


THE FOUNDERS ★ 1891



BARDONS & OLIVER, INC.
1133 W. 9th STREET • CLEVELAND, OHIO



CM "INSWELL" STEEL CHAIN

Industry rightfully depends on its greater strength, safety and long wear

CM "Inswell" Electric Welded Steel Chain is not ordinary chain . . . it's as different as day and night!

The patented "Inswell" electric weld process puts extra metal, for extra strength and safety at the critical point of each link . . . at the weld. Too, "Inswell" welds are at the side, with the extra metal inside. This "Inswell" feature contributes to faster handling and freedom from "kinking".

Formed from a special analysis steel, every link of *CM* "Inswell" Electric Welded Steel Chain is uniform in strength, size, durability and elastic limit . . . is carefully tested to well beyond safe working loads.

For the extra service-time demanded by today's production needs, specify *CM* "Inswell" Electric Welded Steel Chain. There is a size and type for every industrial application.

Call your mill supply distributor for full details, or write for descriptive bulletin.

COLUMBUS-McKINNON Chain CORPORATION

(Affiliated with Chisholm-Moore Hoist Corporation)

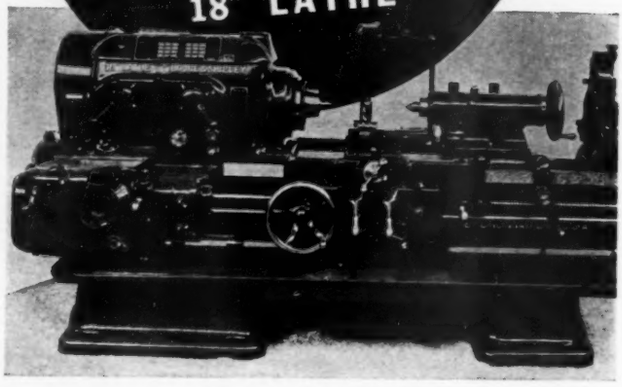
124 FREMONT AVE. TONAWANDA, N. Y.

Branch Offices: NEW YORK • CHICAGO • CLEVELAND

RBC NEEDLE BEARINGS

operate at high efficiency in this

LODGE & SHIPLEY 18" LATHE

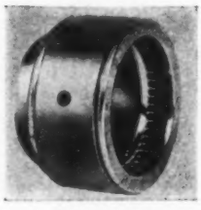


In the apron of this lathe, where space limitation was a big factor in the selection of bearings, RBC Needle types were the logical choice.

The CYCLOPS and 20th CENTURY meet the demand for anti-friction bearings of minimum overall dimensions and maximum carrying capacity. The CYCLOPS is made with a one piece outer race with lubricating and snap ring grooves.

Both bearings are furnished with or without inner races, the CYCLOPS made to fit shafts from ½" to 9¼" in diameter and the 20th CENTURY from ⅜" to 2".

CYCLOPS Bearing



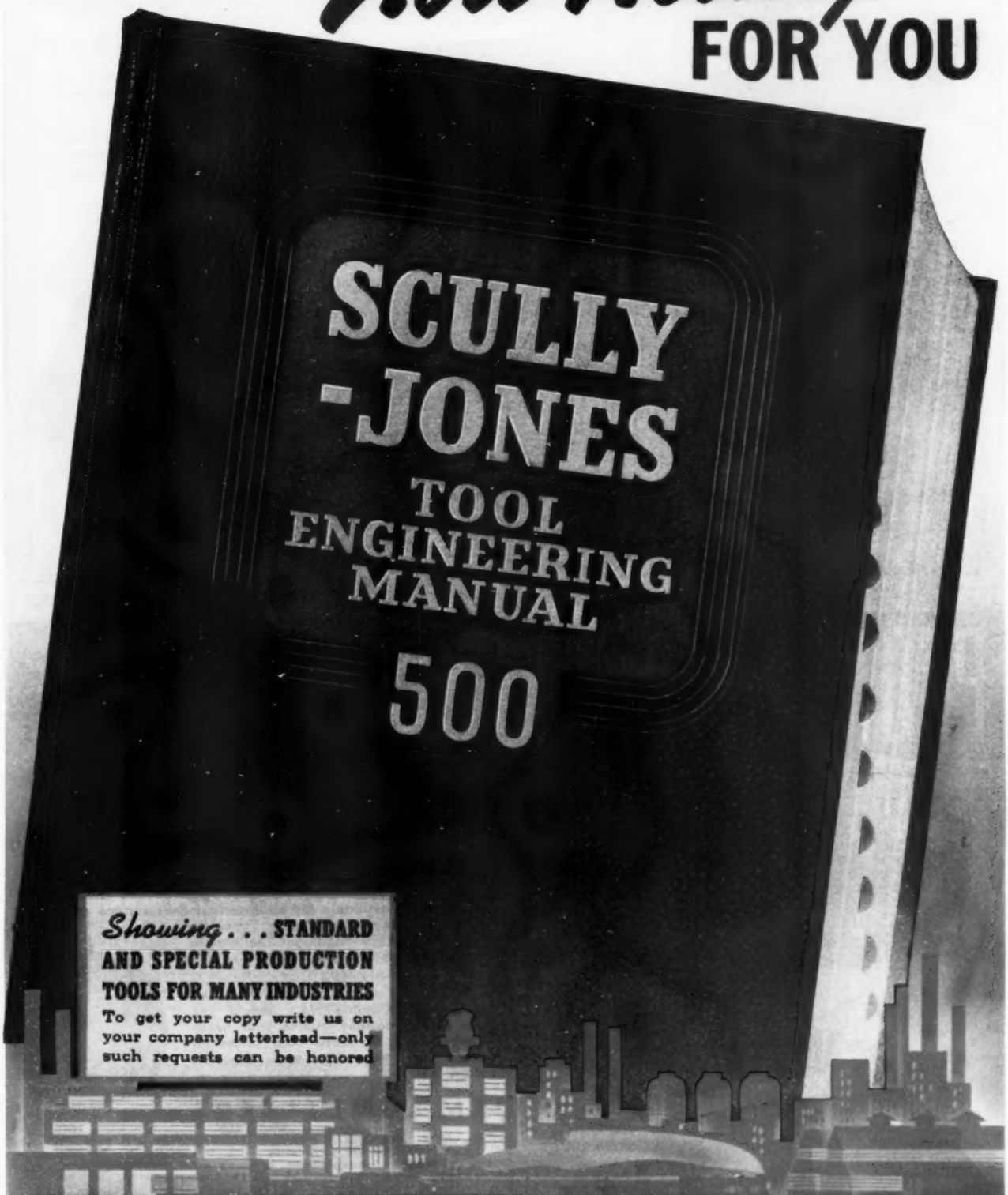
20th CENTURY Bearing

Send for CATALOG with Complete Engineering Data

ROLLER BEARING COMPANY of AMERICA

TRENTON . . . . NEW JERSEY

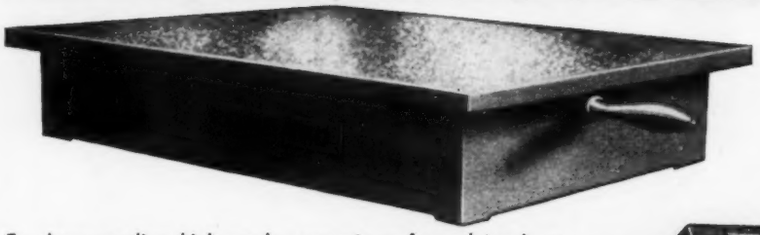
Now Ready FOR YOU



A LARGE 384 PAGE BOOK FULL OF TECHNICAL TOOLING DATA • OVER 500 PHOTOGRAPHS • 400 CHARTS • MORE THAN 560 DRAWINGS • MANY NEW TOOLS • A UNIQUE, NEW, QUICKER INDEX • A PICTURE INDEX • AND MANY OTHER BIG FEATURES

SCULLY-JONES & CO. · 1901 SOUTH ROCKWELL · CHICAGO

Accurate SURFACE PLATES



for Prompt Delivery!

Lombard Surface Plates are ideal for general shop inspection or first piece production inspection.

Extreme accuracy of Lombard Surface Plates is maintained indefinitely through heavy ribbing and 3-point suspension.

To shops needing high grade, accurate surface plates in a hurry, Lombard offers outstanding opportunities to meet those needs promptly. We are geared to produce these plates to the highest degree of precision where extreme surface accuracy is required.

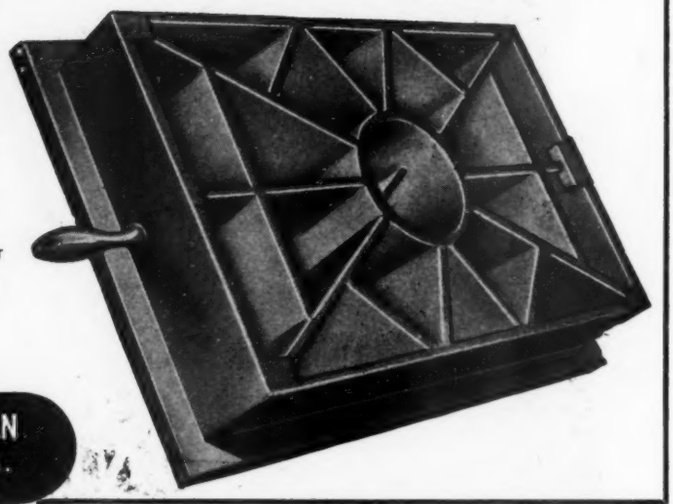
Lombard Surface Plates are specially heat treated to relieve casting and machine strains. They are of extra rigid and heavy construction and carefully hand scraped to insure the closest limits of maintained accuracy.

Available also with planed and hand lapped surfaces. Standard sizes available as follows:

SIZE	WEIGHT	SIZE	WEIGHT
14"x18"	95	*36"x48"	1150
18"x24"	190	48"x48"	1700
24"x24"	295	*48"x72"	3750
24"x36"	450	60"x72"	4850
24"x48"	900	*48"x96"	6550

*Made to Order only

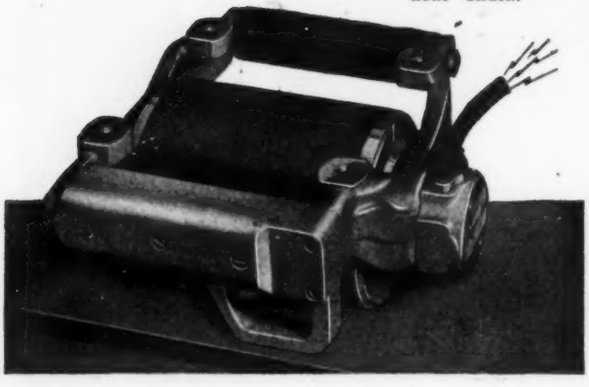
WRITE FOR DETAILS & PRICES



LOMBARD GOVERNOR CORPORATION
200 MAIN ST. ASHLAND, MASS. U. S. A.

PROMPT · · · COMPLETE SERVICE
ON MAGNETIC CHUCKS
from WALKER

No. 617 Bar Pole Rectangular Magnetic Chuck.



If you need magnetic chucks of any size or type quickly—get in touch with Walker.

Not only is the Walker line complete, but many standard units are stocked for immediate shipment. Rectangular and Vertical Face types are available for all American-built surface and heavy duty grinders, as well as Rotary Types for internal and surface grinding. The Walker line also includes magnetic chucks for milling, turning and planing.

You'll find the chuck you need described in the Walker Catalog W4. Should you require special designs, outline your needs and ask Walker to quote. Our prices for "specials" are very little more than for standard units.

Style B Face Plate—in standard diameters from 10¾" to 36½" inclusive.

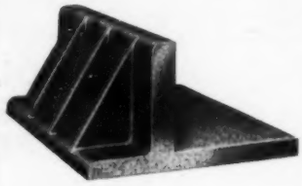
DEMAGNETIZERS

Walker offers these units in standard D.C. and A.C. types for 110 or 220 V. Bulletin K7, giving details on Walker Demagnetizers, is yours for the asking.

O. S. WALKER CO., INC.
WORCESTER, MASS.

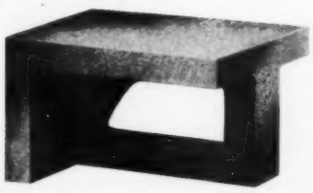
Scraped ANGLE PLATES · V BLOCKS

Lombard angle plates and V blocks are made of high grade close-grained semi-steel type iron, under rigidly supervised control given special heat treatment to relieve casting and machine stress, hand-scraped slowly, carefully, to produce a high degree of precision. Construction is extra rigid and heavy.



INSIDE ANGLE PLATES

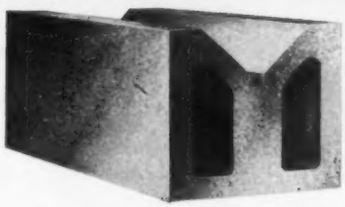
Stock No.	Size (inches)	Wt. per piece, lbs.
468-1A	4x4x6	10
468-2A	6x6x8	23
468-3A	8x8x8	41
468-4A	8x9x10	52
468-5A	10x10x10	75
468-6A	12x12x12	116
468-7A	18x18x18	260



UNIVERSAL RIGHT ANGLE IRONS

Stock No.	Size (inches)	Wt. per piece, lbs.
471-1A	3x4x6	7½
471-2A	4x6x8	15½
471-3A	6x8x12	30½
471-4A	8x10x18	58

WRITE FOR DETAILS AND PRICES . .



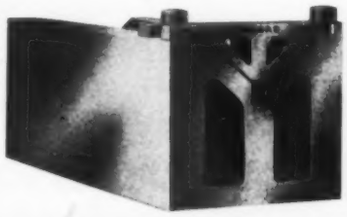
V BLOCKS

Stock No.	Size (inches)	Wt. per pair, lbs.
467-1A	3x2x5	12½
467-2A	4x3x6	25
467-3A	6x6x7	70
467-4A	8x6x8	108
467-5A	8x8x8	120

For holding circular pieces to be milled, ground, shaped, or for inspection work, Lombard hand-scraped V blocks are unexcelled. Sold in matched pairs of identical size. Clamps furnished with blocks as shown below hold securely, prevent slipping.

V BLOCKS with CLAMPS

Stock No.	Size (inches)	Wt. per pair, lbs.
467-1C	3x2x5	14
467-2C	4x3x6	30
467-3C	6x6x7	80
467-4C	8x6x8	118
467-5C	8x8x8	135



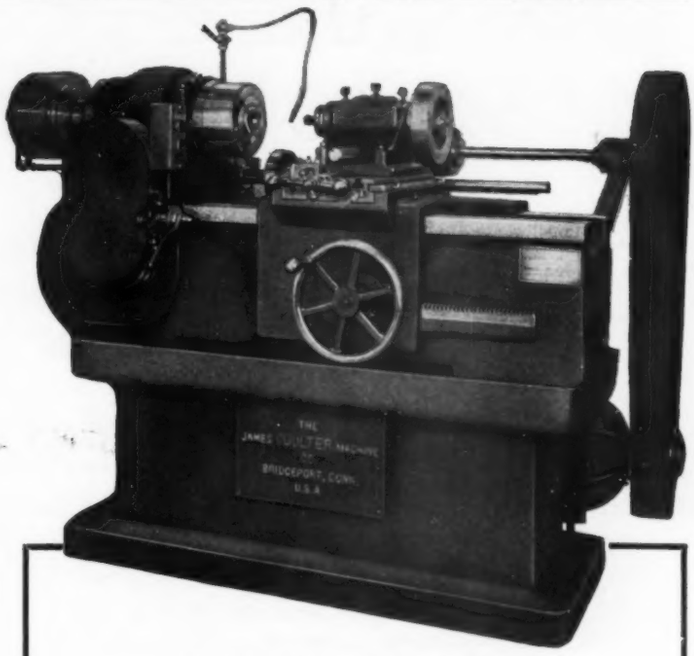
LOMBARD GOVERNOR CORPORATION
200 MAIN ST. ASHLAND, MASS. U. S. A.

Keep Ahead of DEFENSE DEMANDS *on the PRODUCTION of* EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

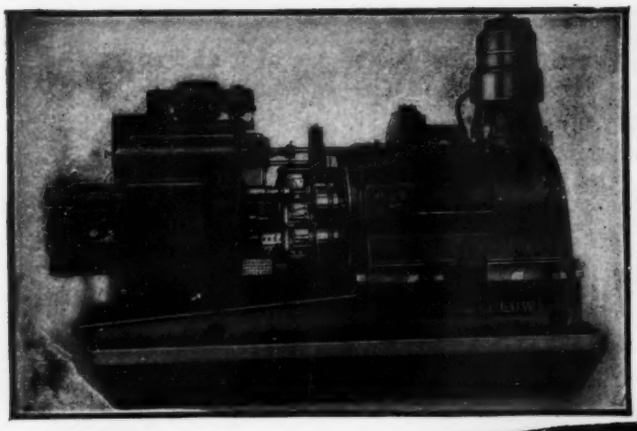
Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

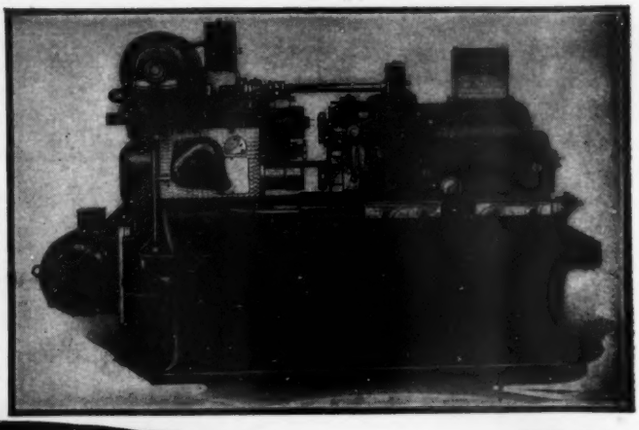
Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT · CONNECTICUT · U.S.A.





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

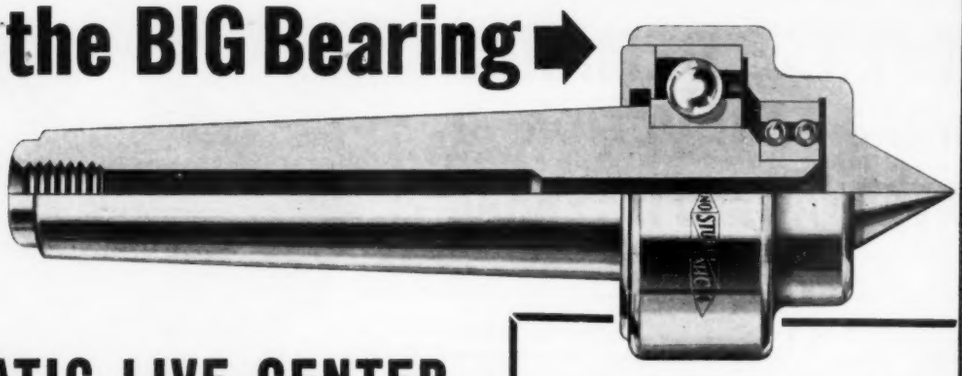
On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

LOOK at the BIG Bearing ➡



. . . and you will see WHY the

STURDIMATIC LIVE CENTER

Increases Production and Lasts and Lasts and Lasts! ! !

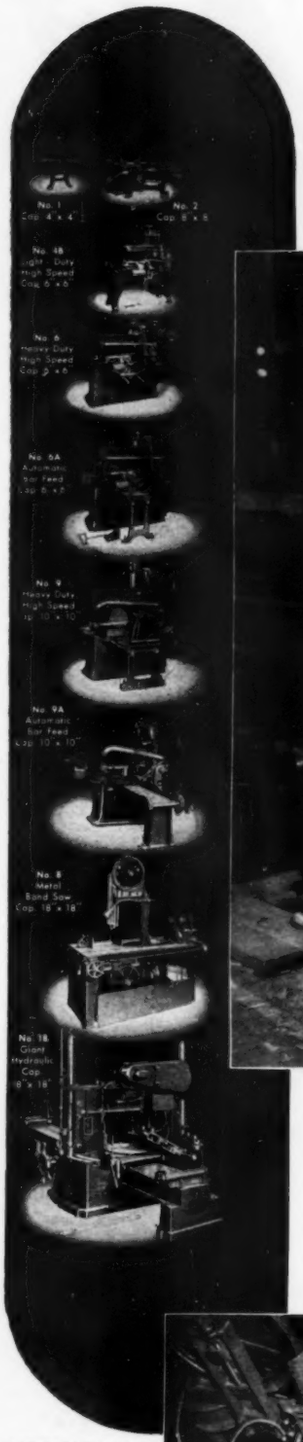
Write for New Illustrated Folder giving complete technical details, specifications, sizes and prices. Standard sizes from stock.

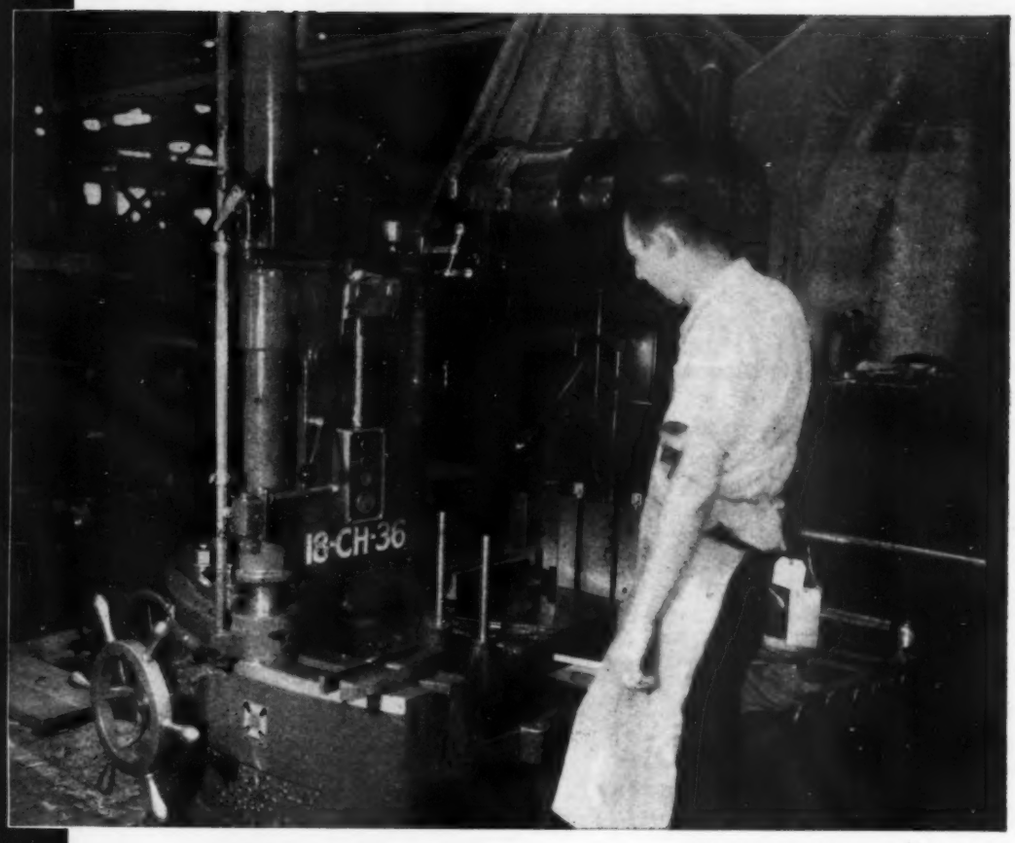
STURDIMATIC TOOL CO. ★
5214 THIRD AVE. DETROIT, MICH.

STURDIMATIC
High-Speed, Heavy-Duty
LIVE CENTERS

- Eliminate "Dead Center" friction.
- Rotate free and easy on ball bearings.
- No distortion of center hole.
- Eliminate chatter.
- Minimum overhang.

MARVEL SAWS





(ABOVE.) The MARVEL No. 18 Hydraulic Hack Saw shown in action at the Philadelphia Navy Yard cutting a test piece of heavy plate.

For Thin Tubes or Heavy Plate!

Two shipbuilding jobs—one at the Philadelphia Navy Yard and one at the New York Shipbuilding Corporation—demonstrate the wide variety of jobs that can be performed on MARVEL Sawing Machines. Producing a clean 45° mitered cut in tubing of thin cross-section, or sawing through thick sections of heavy plate are just two of the many jobs that can be turned out with speed and economy on MARVEL Saws.

Take advantage of MARVEL Free Technical Service! At your request a competent MARVEL Engineer will study your metal-cutting problems and make recommendations for increasing your metal sawing efficiency to meet the increased demands of defense production.

(AT RIGHT.) At the New York Shipbuilding Corporation, a MARVEL No. 8 Universal Tool Room Sawing Machine finds wide application in cutting bars, tubes, etc., either straight through or at any desired angle up to 45°. The machine will accommodate one or more pieces of stock up to 12" square in cross-section.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave., Chicago, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York

Your Turret Lathe Problem

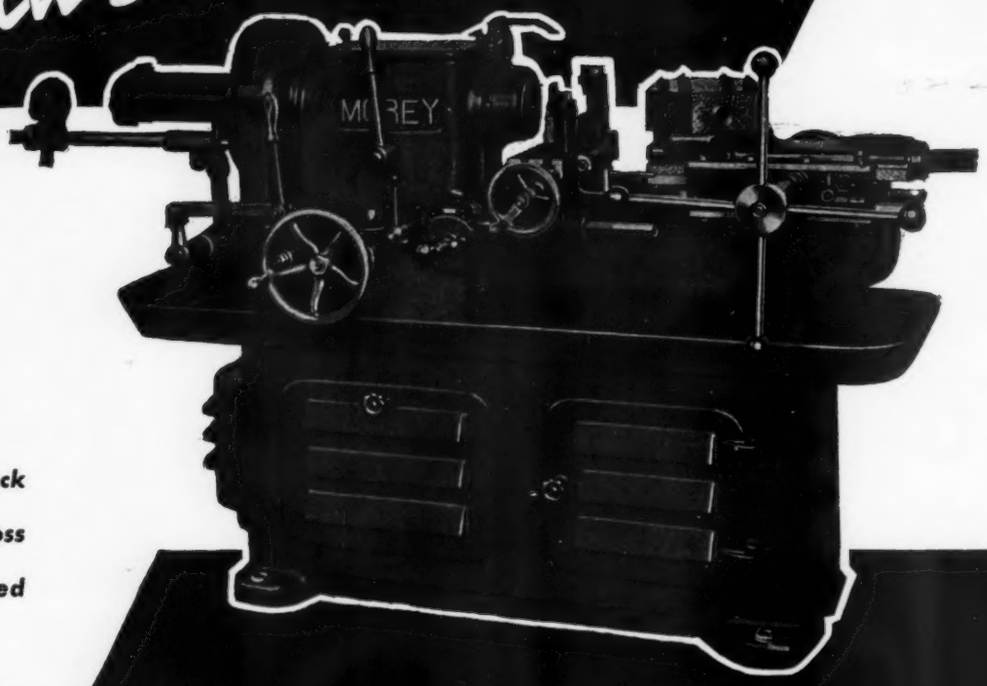
Solved! The MOREY 2G

1" COLLET CAPACITY

TURRET LATHE

Timken Bearing—Self-Locking Turret—Infinite Spindle Speeds

Quick Delivery



CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Full description and detailed illustrations are shown in Bulletin 629. Ask for it TODAY!

Join the parade of high speed defense producers with the MOREY 2G *Timken Bearing* Turret Lathe, with *Self-Locking Turret*. You are assured *vibrationless precision* with an *infinite variety* of spindle speeds for every job. It's designed to take full advantage of *high speed* and *carbide tools*. Back gears are instantly thrown in through *extra large* Twin Disc Clutch. *Can be furnished with Tooling!*

MOREY MACHINERY CO., INC

410 BROOME STREET • NEW YORK, N. Y.

Forestall Replacement Problems!

These 2¼-in. long plunger lever pins for diesel engines are cast of Haynes Stellite alloy and finished by grinding to accurate dimensions.

This 2-in. O. D. piston and cylinder, for use in a die casting machine, are made of Haynes Stellite alloy to withstand abrasion, heat, and corrosion.

Haynes Stellite wear strips on boring, driving, and pilot bars keep them accurately aligned, eliminate galling, and reduce maintenance.

These Haynes Stellite valve stem caps for diesel engines are used to combat severe conditions of abrasion and heat.

use Haynes Stellite Alloy Parts to resist

ABRASION . . . HEAT . . . CORROSION

● Machine and automotive parts which are made of Haynes Stellite alloy stand up for long periods of use even when subjected to severe abrasion, erosion, heat, or corrosion. For this reason, parts made of this wear-resistant alloy are being used increasingly at vital points to help avoid shutdowns . . . to reduce maintenance costs . . . and to forestall problems of parts replacement.

Haynes Stellite alloy specialties ranging in size and shape from phonograph needles to intricate, cored castings like the lever pins shown above are regularly made to order—cast and ground to customers' specifications. Stampings or forgings of a malleable grade are also supplied. For more information, write or phone the nearest district office—today!

Take Advantage of This Unique Combination of Properties

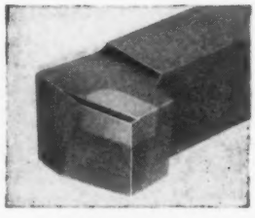
- Haynes Stellite alloy is inherently hard and abrasion-resistant, even at red heat.
- Haynes Stellite alloy is resistant not only to atmospheric corrosion, but also resists the action of many corrosive materials.
- Haynes Stellite alloy takes a high polish.
- Haynes Stellite alloy has a low coefficient of friction.

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company

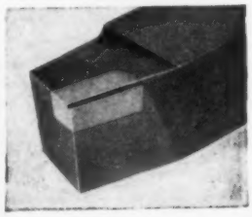
HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation
New York, N. Y. UCC Kokomo, Indiana
Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

Interrupted Cuts —
WON'T INTERRUPT PRODUCTION

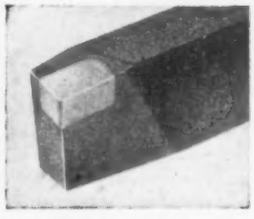
When KENNAMETAL is in the tool rest



STYLE 21 TOOL



STYLE 11 TOOL



STYLE 19 TOOL

Because of its superior tensile strength (305,000 lbs. per sq. in.) KENNAMETAL can be used in making interrupted cuts without danger of tool breakage. The illustration shows four KENNAMETAL Style 11 tools machining a cast armor steel tank rotor on a 48"x84" engine lathe. Turning speed is 165 surface ft./min. with a feed of 0.014" per rev. and a depth of cut ranging from ¼ to ½". Large 1" x 2" tool shanks are employed to provide adequate support for the KENNAMETAL tips and the tools are staggered so that only one tool hits the work at a time.

If interrupted or jump cuts are causing excess tool breakage and consequent delays in your plant, investigate the superior strength, hardness and crater resistance of KENNAMETAL. Write for free copy of the new vest pocket manual for KENNAMETAL users. It explains in detail how to get the utmost in production from your KENNAMETAL tools.

KENNAMETAL
The Accepted
STEEL CUTTING
CARBIDE

McKENNA METALS Co.
103 LLOYD AVE., LATROBE, PENNA.

MAKE EXTRA MONEY!

You can have extra money by conducting a business of your own in your spare time by taking orders for the

Big New Seventh Edition
of the
AMERICAN MACHINISTS' HANDBOOK

Every man in your shop and other shops will find this practical Handbook of 1368 pages as useful as any tool in his kit.

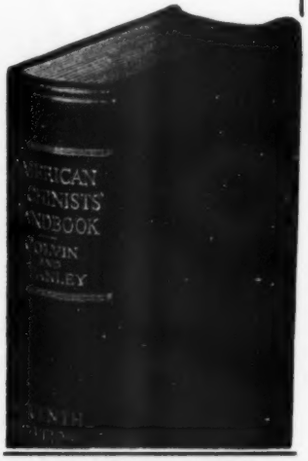
Our spare time representatives in large and small shops have successfully sold thousands of copies of previous editions of the Handbook with profit to themselves.

HERE IS THE PLAN

This new seventh edition will be wanted by thousands of machinists, toolmakers, draftsmen, apprentices, in fact, anyone connected or dealing with machines. This book sells itself.

You can have the agency for your shop and get a liberal commission on every book you sell.

Send the attached coupon for full details.



Without obligation to you and for the cost of a three-cent stamp you can have full details of the plan and information regarding the advertising literature sent FREE in order to help your sales.

Send the Coupon Now

MONEY-MAKING COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York

Please send me without cost or obligation to myself, your plan by which I can profitably turn my spare time into money.

AMERICAN MACHINISTS' HANDBOOK

Signed .....
Address .....
Company .....
Position .....A. 4-2-42

INVENTORS AND MAKERS OF INDUSTRIAL MACHINERY SINCE 1875

Back in Horse 'n' Buggy Days

THE HUB-BORER!

An important machine-tool in its day, this Lipe-created HUB BORER was a step toward mechanization of industry. It encouraged the thinking which brought about the horseless carriage, a development in which Lipe inventive resource and designing skill also played a valuable part.

Now, for today's mechanized-war era, the

LIPE

CARBO-MATIC LATHE

for faster precision turning of tough armament alloys . . .

War or no war, the higher cutting speeds of the carbide tool were bound to come—everybody knew that. But Lipe engineers also saw that a more powerful lathe of greater rigidity would be needed to handle the heavier cuts and higher speeds which any improvement in cutting tools would bring.

That's why the LIPE Carbo-Matic Lathe was designed. It has a cone worm-gear and multiple V-belt drive for a smoother, more powerful cut. The base is as rigid as a rock. Even the strains of "hogging off" tough armament steels cause no distortion, no chatter or tool breakage . . . no out-of-round, out-of-true or other work spoilage.

In a single operation, it turns to ordinary rough-grinding tolerances. And it is fast on multiple-operation cycles, because it is fully automatic. The operator merely loads and unloads the work. Hydraulic power operates the holding equipment, longitudinal and cross feeds and tailstock quill. Swing over carriage 8″, between centers 30″. Factory facilities expanded to meet the demand; write for delivery dates.

LIPE-ROLLWAY CORPORATION, SYRACUSE, N. Y.

Vitrified

Cuts longer between turns

Vitrified Grinding Wheels assure economy in high quantity production fine precision grinding because they cut longer between each wheel truing. Then, too, these long life, strong wheels require less redressing. They can also be depended on to eliminate gumming, glazing and heating.

All these advantages are available regardless of the grinding job, because there is a size, shape and type Vitrified Grinding Wheel for every grinding purpose. The completeness of the Vitrified line makes it possible for any shop to standardize on Vitrified Wheels.

Our engineers will gladly study your grinding operations and point out the savings you can make through the use of Vitrified Wheels.

BORITE—for all kinds and classes of steel grinding.

CARBORITE—for all classes of cast iron, brass, bronze and aluminum grinding.

Also, Silicate, Shellac and Resinoid Bonded Wheels.

VITRIFIED

VITRIFIED WHEEL COMPANY

WESTFIELD MASS.

WILLARD Spring TOOL HOLDERS

FINER QUALITY WORK AND FASTER CUTS—ASSURED WITHOUT CHATTER OR DANGER OF TOOL BREAKAGE . . . . . .

Willard Tool Holders have been specially developed to save time and insure precision on high production repetitive work such as that demanded in shops busily engaged in AUTOMOTIVE, AIR CRAFT and DEFENSE MANUFACTURING.

They are available for a wide number of operations and hold tools securely against chatter. Cutter breakage is eliminated and the possibility of damaged work reduced to a minimum.

PROMPT DELIVERIES

Write today for descriptive folder which gives details on Willard Tool Holders for Forming, Threading and Forming Tools, Cutting Off Tools and Threading Tools.

Cutting-off Tool Holders reduce cut off time in half over solid tools. Spring feature makes faster feeds and heavier cuts safely possible.

Forming Tool Holders—adapted to a wide range of work in lathes, shapers and screw machines. Any number of cutters can be used in the same holder.

Forming Tool Holders — with straight and right hand offset—for holding ground high speed cutters. Fast, smooth cutting assured free from cutter marks. Ratchet design prevents cutter from turning under heavy feeds.

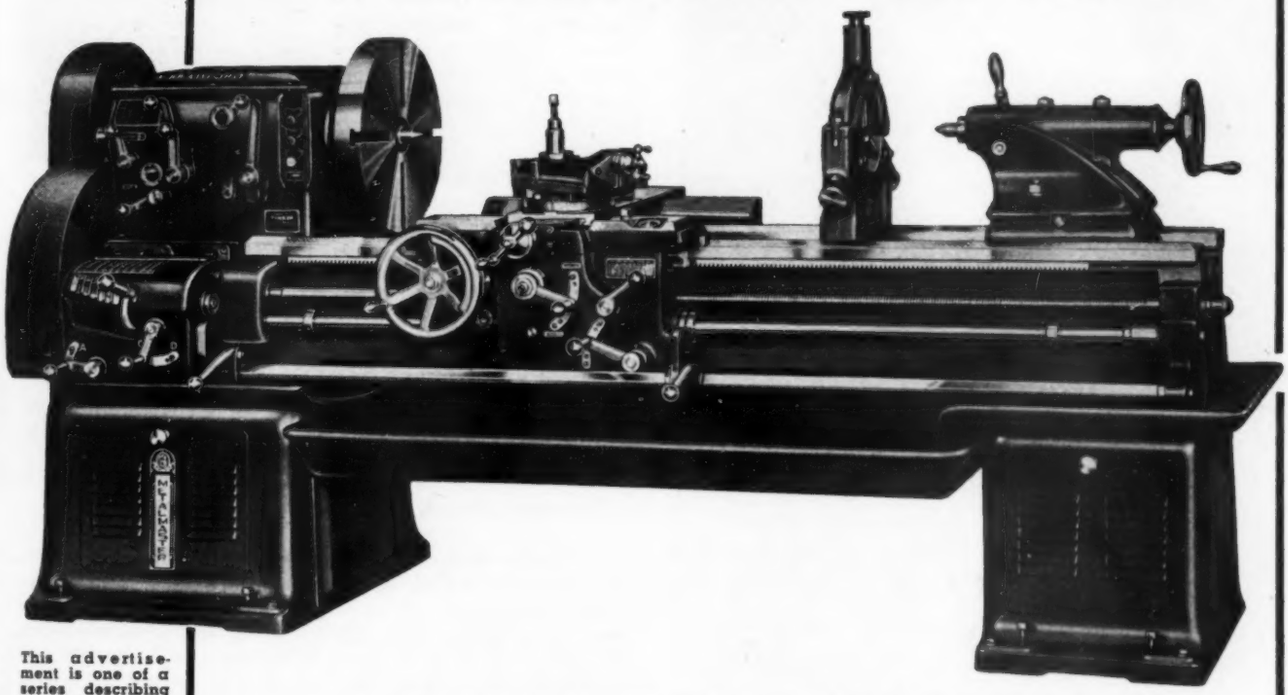
Product of **AUTO-ORDNANCE CORPORATION**

Manufacturers of THE THOMPSON SUBMACHINE GUN

TRADE-MARK Thompson REG. U.S. PAT. OFF.

1437 Railroad Avenue
BRIDGEPORT, CONN.

the Metalmaster



This advertisement is one of a series describing in detail the principal elements of The Bradford Machine Tool Co's. new METALMASTER Geared Head Lathes. Write for the complete story in one convenient folder.

• • • BUILT TO GIVE MAINTENANCE-FREE SERVICE, 24-HOURS-A-DAY, 7 DAYS A WEEK!

★ The METALMASTER QUICK CHANGE BOX is a rugged one piece casting, constructed so as to exclude dirt and chips. Bolted to the bed, it houses the mechanism for feed and thread cutting changes (64 changes including 11½ threads). This wide range is made without pick-off gears. Simple and easy to operate, changes can be made instantly! Gears are alloy steel, with accurately cut teeth. Sliding gears are mounted on splined shafts for easy engagement. All shafts and gears are mounted on anti-friction bearings, and all are oiled from central reservoir. Index plate shows feeds and speeds. An idler gear connects feed box to head gearing—can be replaced by special compounding or translating gears for odd thread not included in box or metric screws.

★ The METALMASTER APRON is a sturdy, double walled, one piece casting of box type construction securely keyed and bolted to the carriage. No brackets or supports bolted on that can work loose. Positive jaw clutches controlled by a single lever are used for length and cross feeds—these replace troublesome friction clutches. Length or cross feeds cannot be accidentally engaged when either of the other is in use. Leadscrew and feed rod cannot be engaged for feeding at the same time. Feed gears and clutches dip into oil reservoir and carry a supply of oil to all shaft bearings. Feed reversing gears are inside apron and submerged in oil. Sight gage on front wall indicates proper oil level to be maintained.

METALMASTER SIZES:

SWING
12", 14" and 16"

BED
6' to 16'

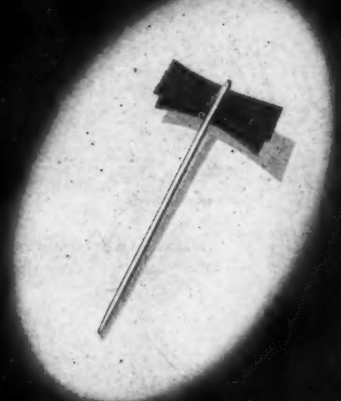
From HEADSTOCK To TAILSTOCK, THE *METALMASTER* IS A PRODUCT OF HIGHLY SKILLED ENGINEERING DESIGN AND MODERN MANUFACTURING METHODS . . . THE *ULTIMATE* IN A SPEEDY METAL TURNING UNIT

THE BRADFORD MACHINE TOOL CO.
CINCINNATI, OHIO
MAKERS ALSO OF UNIT TYPE DRILLING & TAPPING EQUIPMENT

PRECISION TOOLS SINCE 1840

NORTON ABRASIVES

WE CROSSED A BUTTERFLY WITH A DARNING NEEDLE



For Better Airplanes

Look at the photograph. Tiny pieces of just the right Metalite Cloth back to back, poked through the eye of a common darning needle. Fitted to one of your own portable tools it removes burrs from oil holes too small to finish in any other way. At the same time it puts a perfect radius on the sharp edges. Seconds in place of minutes!

Don't be too satisfied with your present methods. They may be 100%. But our salesmen and field engineers can recommend dozens of special new shapes in just the right mineral coating, grit, weight and flexibility of backing to do *any* sanding job, big or little, in the one best and fastest way.

No need to guess. Get in touch with our nearest office.

BEHR-MANNING, Troy, N. Y.
(DIVISION OF NORTON COMPANY)

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma

SYMBOL OF
COATED ABRASIVES
Tested Through 70 Years

How to install and overhaul all types of airplane engines and accessories

Consult Colvin's *Handbook* for constructional features of airplane engines, specifications, limits of wear, electrical and lubricating systems, etc., methods of installing, disassembling and assembling them, caring for and adjusting their parts, etc.—everything necessary to the intelligent performance of inspecting, servicing and repair work. Check your problems against best accepted practice, as reflected in its fact-filled pages.

Just Out! *New 5th Edition*

AIRCRAFT HANDBOOK

By Fred H. Colvin

784 pages, 5½x8, 621 illustrations, 112 tables, $5.00

The Handbook covers all types of engines and their accessories, and adjustable propellers, the most used airplane instruments, landing gear floats, etc.—with a profusion of understandable descriptions, tables, diagrams, servicing and trouble-shooting procedures. Here is the means of avoiding errors, saving time and trouble in procuring vital information, assuring yourself of best results in a wide variety of problems.

Can you answer questions like these?

What are the valve specifications of the Allison V-1710-C15 engine?
What 15 connections should be watched in mounting a Twin Wasp engine for test?
What are the piston and connecting rod fits and clearances of the Rolls-Royce Merlin engine?
What are the recommended 9 points for 10-hour test on Lycoming opposed-cylinder engine?
What are 10 checks for low power in Ranger engines?
What is the complete procedure for assembling the Continental A-40?

SEE Colvin's AIRCRAFT HANDBOOK, New 5th Edition

McGRAW-HILL
ON-APPROVAL COUPON

McGRAW-HILL BOOK COMPANY, INC.
330 West 42nd Street, New York, N. Y.

Send me for 10 days' examination, subject to approval or return, Colvin—Aircraft Handbook. At the end of 10 days I agree to pay $5.00, plus a few cents for postage and delivery, or return the book postpaid. (We pay postage on orders accompanied by remittance.)

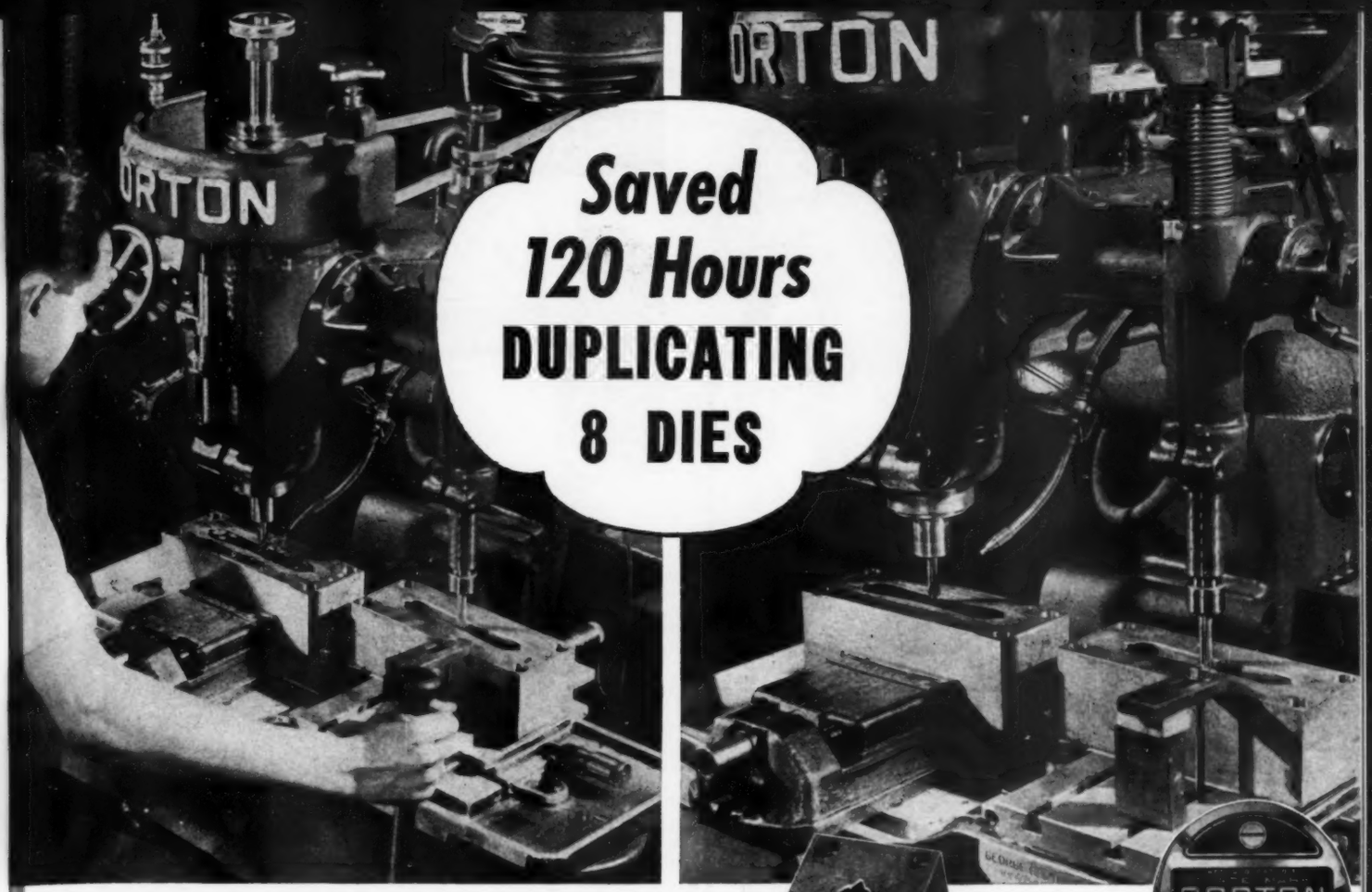
Name .....

Address .....

City and State .....

Position .....

Company .....A. 4-2-42



Saved 120 Hours DUPLICATING 8 DIES

. . . Using a GORTON DUPLICATOR

EIGHT die molds are duplicated from the original master mold at the National Lock Co., Rockford, Ill.—a job that formerly took 40 hours per die—now done in 25 hours each.

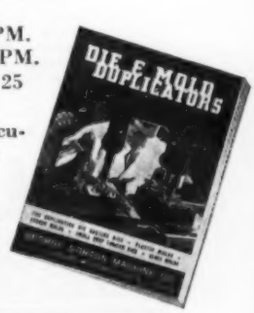
With the Gorton Duplicator these dies are duplicated to within a maintained accuracy of .001". Setups are simply and quickly made as shown. Micrometer adjustments are provided for adjusting the table holding the master die in both directions to align it with the work piece. A series of standard end mills are used for the roughing operations, and run at a speed of 500 RPM. Finishing cuts are taken by special ground cutters which run at a speed of 1100 RPM. Exceptionally smooth finishes are produced, which reduce polishing time to a minimum.

If you make dies or molds, or operate a tool room, it is possible that a Gorton Duplicator will step up production and save hours of time. Gorton Engineers are experts in the design and development of time-reducing die and mold duplicating equipment. You may consult them on your work for their advice and recommendations without obligation.

NOTE—To owners of GORTON Super-Speed Vertical Milling Machines built since 1935—order a Gorton Duplicating Tracer Head and Duplicating Table to quickly convert your Miller into a double-purpose machine, capable of duplicating parts and sinking dies, as well as milling.

SUPER-SPEED MILLING DATA

MACHINE—Gorton Super-Speed Vertical Milling Machine with Die Duplicating Attachment.
PART—Die Molds for Handles.
QUANTITY—8.
MATERIAL—Machine Steel.
CUTTERS—Standard End Mills—Special Ground Cutters.
OPERATION—Duplicate Milling Die Molds.
DIMENSIONS—7⅜" x 2¼" x 1⅛".
HOLDING—In a Simple Table Vise.
FEED—Hand Feed.
SPEED—Roughing—500 RPM. Finishing—1100 RPM.
FLOOR-TO-FLOOR TIME — 25 Hours Complete.
ACCURACY—Maintained Accuracy of .001" with Extra Fine Finish.



WRITE FOR FREE CATALOG 1319-D giving full details on Gorton Duplicating Equipment.

GEORGE GORTON MACHINE CO.

1315 RACINE STREET, RACINE, WISCONSIN, U.S.A.

SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING

QUEEN CITY

BALL BEARING

BENCH, PEDESTAL and DISC

GRINDERS

Built in a complete range of sizes in bench, pedestal, and heavy duty box type bases from 1/3 H.P. to 10 H.P. units.

This grinder is a powerful—sturdy unit equipped with two Carborundum wheels, one course, one fine—safe enclosed guards with built-in exhaust—Allen Bradley push button switch with overload protection—adjustable and safe work rests—tool tray—water pot—adjustable, shatter proof, clear glass eyeshields.

You can also save on initial cost with Queen City Grinders.

QUEEN CITY DEALERS ARE STRATEGICALLY LOCATED FOR YOUR CONVENIENCE.

Smith-Booth-Usher Co	Los Angeles, California
Machinery Sales Co	San Francisco, California
William Rath	Melbourne, Florida
Cameron & Barkley Co	Miami, Florida
Chandler Machinery Co	Atlanta, Georgia
Geo. M. Bernstein & Co	Chicago, Illinois
Indianapolis Machinery & Supply Co	Indianapolis, Indiana
Dixie Mill Supply Co., Inc	New Orleans, Louisiana
Dixie Mill Supply Co., Inc	Shreveport, Louisiana
Jos. Beal & Co	Boston, Massachusetts
James W. George Machinery Co	Detroit, Michigan
Chas. W. Stone	Minneapolis, Minnesota
Eichman Machinery Co	Kansas City, Missouri
McDonald Machinery Co	St. Louis, Missouri
Morris Machinery Co	Newark, New Jersey
A. Klingelhofer, Inc	New York, New York
Cincinnati Machry. & Supply Co	Cincinnati, Ohio
Hess-Schenck Co	Cleveland, Ohio
E. W. Smith Machinery Co	Columbus, Ohio
C. H. Gosiger Machinery Co	Dayton, Ohio
Elyria Belting & Machinery Co	Elyria, Ohio
General Tool Co	Portland, Oregon
David T. Bury	Erie, Pennsylvania
Monarch Machinery Co	Philadelphia, Pennsylvania
Galbreath Machinery Co	Pittsburgh, Pa.
H. Leach Machinery Co	Providence, Rhode Island
Noland Company, Inc	Chattanooga, Tennessee
Deaderick Machinery Co	Knoxville, Tennessee
Hamilton-Huster Machinery Co	Dallas, Texas
Wessendorff, Nelms & Co	Houston, Texas
Smith-Courtney Co	Richmond, Virginia
West Coast Machinery Co	Seattle, Washington
State Machine Tool Co	Milwaukee, Wisconsin
M. J. Byrns	Washington, D. C.

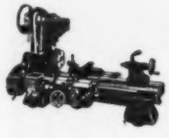
QUEEN CITY
MACHINE TOOL CO.

218 EAST SECOND ST. **CINCINNATI, OHIO**

SHELDON Back Geared Screw Cutting PRECISION LATHES

For the Tool Room

The finest 10", 11" and 12" lathes ever built in the moderate price field. Large special analysis steel spindles GROUND ALL OVER, with extra collet capacity. Hand-scraped Bronze, Ultra-Precision Ball or Super Precision Roller spindle bearings, (the finest bearings obtainable). Heavy braced, semi-steel beds with hand scraped ways (2 V-ways and 2 flat ways) These lathes come with a choice of aprons, gear boxes, and drives including the anti-friction, 4-speed, V-belt Lever-operated pedestal base motor drive illustrated. Telescopic Taper Attachment and other accessories available.



For Production

Sheldon Lathes will stand up to any production work within their capacity—are ideal for second operation work. Production models available with any or all of these features: Ultra-Precision Ball or Super-Precision motor spindle bearings. Lever-operated Collet Attachment, Lever-operated Tail Stock, Lever-operated cross slide with double tool post, Lever-operated turret, etc.

For Machine Shop

Both Bench and floor models with choice of Semi-quick or Full-quick Change Gears, Plain Aprons or Worm Feed Apron with Power Cross Feed. Overhead, Back or Underneath Motor Drives—Telescopic Taper Attachments, Tool Post Grinders, Milling attachments and all standard accessories.

Write for Catalog and name of nearest distributor.

SHELDON MACHINE CO., INC.

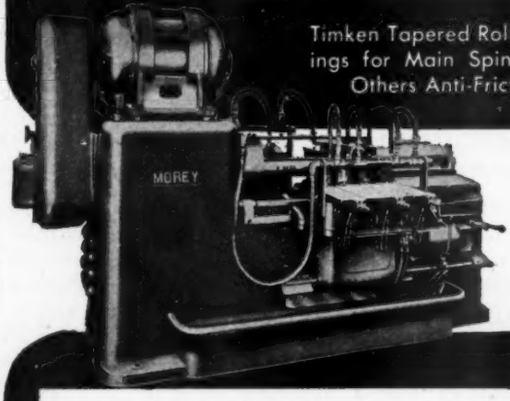
4234 N. KNOX AVE. **CHICAGO, U.S. A.**

Suitable for 105 M.M. to 155 M.M. Shells

The MOREY "27" SHELL LATHE

HEAVY DUTY—SEMI-AUTOMATIC

Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction.



Semi-Automatic: A complete feeding and return cycle. A single movement of the starting lever starts the spindle revolving and the tools feeding. When work is completed, tool is returned to loading position, spindle is stopped and the work unclamped ready for removal.

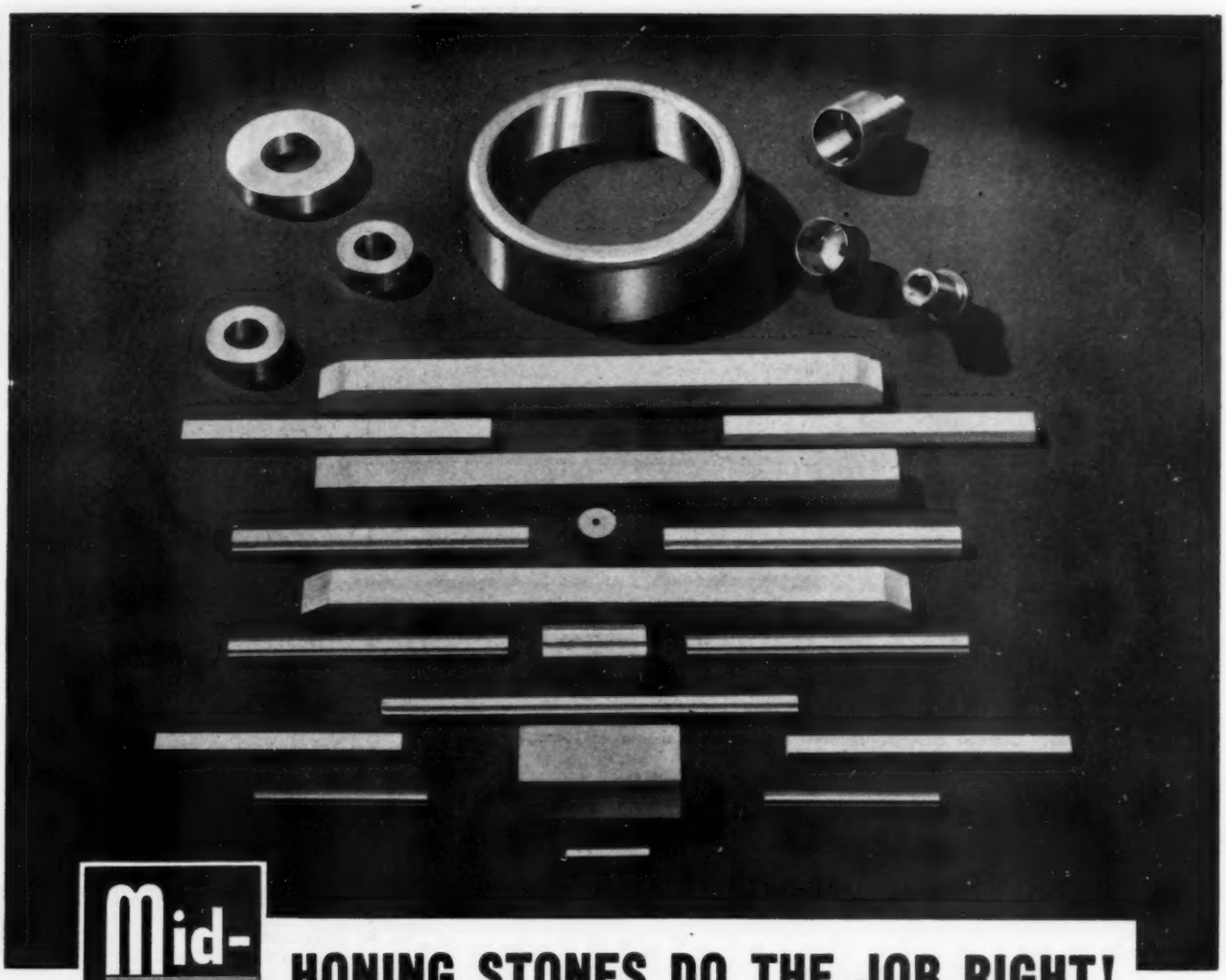
Rigid enough to use carbide tools to their full capacity.

This lathe is entirely self-contained—no outside or auxiliary equipment required.

Full details in Circular 715—ask for it

MOREY MACHINERY CO., INC.

410 Broome Street **New York, N. Y.**



Mid-West

HONING STONES DO THE JOB RIGHT!

If you need a stone that will give you accuracy to the millionth of an inch—that are always uniform in cutting qualities —that are guaranteed to be of exactly the same size, shape, hardness and grain structure at all times, specify MID-WEST HONING STONES. Only in MID-WEST can you be assured of getting these qualities constantly. Made with the new Micro Abrasive, MID-WEST stones are *guaranteed* to be accurate. No matter what your honing problem may be MID-WEST stones will do the job RIGHT.

Whether you are making anti-aircraft or machine gun parts, cylinder, piston, or crank pin bores, connecting rods, oil seats or valve tappet guides, to get best results use MID-WEST stones. These stones will fit any standard or special, honing, lapping or super-finishing machine. Samples shipped from stock immediately.

MID-WEST ABRASIVE COMPANY

Manufacturers of grinding wheels, sandpaper and emery cloth

2189 Beaufait, Detroit, Michigan

MID-WEST ABRASIVES

CARD MACHINE SCREW TAPS

The CARD Quality

Buy them and put them to work

Carbon and High Speed Steel

Manufactured in Regular Type in 2, 3 or 4 flutes according to size and in Spiral Pointed Type in 2 flutes.

Both Regular and Spiral Pointed Types are furnished with National form of thread. Regular Type furnished in taper, plug or bottoming styles; Spiral Pointed furnished in plug style only. Furnished in Carbon, High Speed cut and High Speed Ground Thread.

Put Card Machine Screw Taps to work and their performance will convince you of their economy. You'll find sizes listed in the Card Catalog No. 34, pages 32-37. Circular covering recommended uses available on request.

Leading dealers carry the Card line

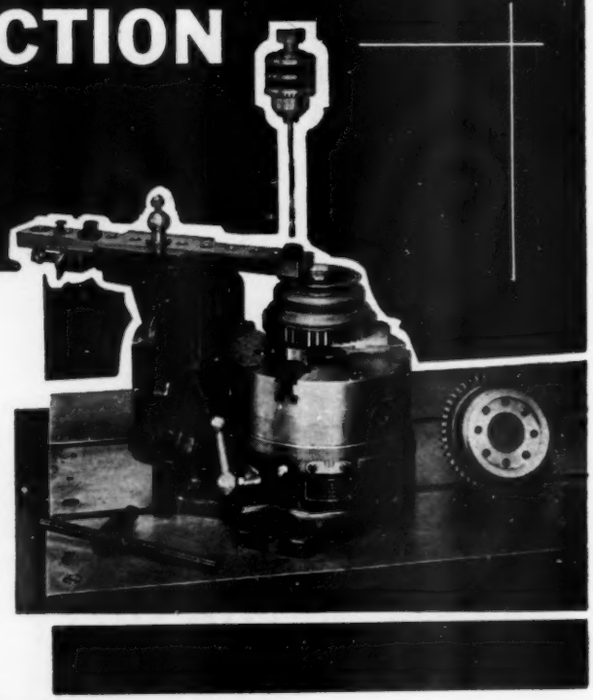
S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO

STORES: New York: 61 Reade St., Chicago: 11 S. Clinton St.
Detroit: 6540 Antoine St., San Francisco: 121 Second St.
Seattle: 568 First Avenue, South
Los Angeles; 524 East Fourth Street

STEP UP PRODUCTION

By taking advantage of higher speeds and feeds in indexing work with the

HARTFORD SUPER-SPACER



This modern, sturdy device meets all demands for higher production on indexing operations. Accuracy under heavy cuts is assured and capacity limited only by the capacity of the method employed in holding and the power of the machine tool on which the Super-Spacer is used.

The HARTFORD SUPER-SPACER can be depended on for the accurate control of all machining operations within the scope of its utility, including milling, drilling, slotting and planing. It pays for itself whether used on single pieces or many.

The Hartford Drilling Attachment, easily attached to the Super-Spacer, provides a simple, practical way to extend the utility of this device to include work ordinarily requiring expensive jigs and fixtures.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD CONNECTICUT

SEND FOR DETAILS OF THIS TIME-SAVING SPACING DEVICE

Jobber Delivers Vital Equipment 8 months ahead!

Suppose you were manufacturing machine tools that were indispensable to War Production—and

Suppose you required a new piece of gauging equipment for a high-precision job and held the necessary Priority but couldn't get factory delivery for at least 8 months:—

What then?

Well, if you were already making proper use of *your* Industrial Supply Distributor, you naturally would go to him first. And right there the "supposing" ends—for here is exactly what followed in that Manufacturer's experience:

He found his local Jobber:—

1—already had the Precision Gauge in stock;

2—had a Priority of his own that he could apply immediately;

3—The Jobber *could* and *did* deliver in a week.

Actually the Distributor's foresight enabled the Manufacturer to add the equal of **2/3ds of a year** to his priceless, all-too-limited production time.

Your own Jobber can and will help *you*—not so dramatically every time but always *soundly*—enabling you to co-operate with other manufacturers in increasing the Nation's total volume of fighting material.

You can depend on their teamwork—just as *we* have, during the many years in which Mill Supply Companies have served as this Company's exclusive Distributors of Cle-Forge High-Speed Drills and Peerless High-Speed Reamers over every square mile of Industrial America.

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

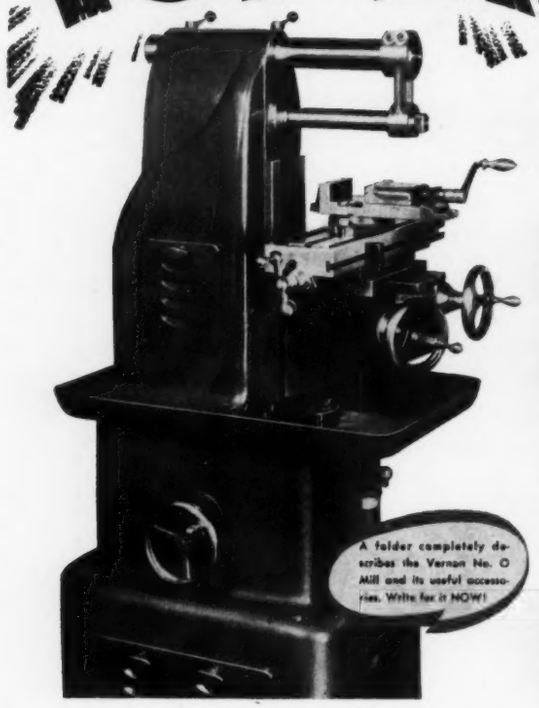
The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD.- 35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

POWER For Heavy Cuts!

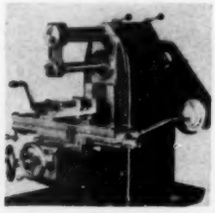


One H.P. motor on Vernon No. O Mill supplies ample power for milling steel, cast iron and other tough metals besides the lighter alloys commonly used in today's defense work. Double Vee belt to spindle transmits power efficiently... eliminates belt slippage even on heavy, slow-speed cuts.

WIDE VERSATILITY

High speed production and difficult setup utility are increased by many accessories especially designed for the Vernon No. O Mill . . . all available as standard extras.

COOLANT SYSTEM – 1/10 H.P. splash-proof motor drives gusher type pump, providing large, steady volume of coolant. Chip strainers are located in return circuit. Unit includes all necessary fittings.



LONGITUDINAL POWER FEED—Permits operator to attend more than one machine on production jobs—saves time... assures uniform cutting... makes smoother finish on all work. Driven direct from spindle. 3 table feeds available.

UNIVERSAL VERTICAL MILLING ATTACHMENT—Quickly installed . . . Head swivels and locks at any angle in any plane . . . Maximum distance between collet end of spindle and table top: 10¼"—exceptional capacity even for larger mills.

MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST. VERNON LOS ANGELES CALIFORNIA
Vernon Line of **HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS**

Illustrated above is an actual inspection laboratory equipped with our products. This plant guards against rejections, disputes regarding measurements, waste of materials by using the Scherr Limited Budget Inspection Laboratory.

INSPECTION IS AS IMPORTANT AS PRODUCTION
Use the SCHERR Limited Budget Inspection Laboratory

Plant conversion and increased production are vital. **BUT DON'T OVERLOOK INSPECTION.** Machine tools may be speeded up, over-time and extra shifts installed. Yet this will be of no benefit if the accuracy of your product is lost with your material ending on the scrap heap.

Your best investment is in inspection tools to detect and eliminate errors at the source before they can affect your production. During these days of sub-contracting an inspection laboratory is absolutely essential since the work of many plants must fit and interchange.

THE WILDER PROJECTOR

The Wilder Projector enables you to see exactly where tools, templets, gages, threads, etc., vary from specified dimensions and contours, and how much they are out. Magnifications available from 10x to 100x.
PRICE.....$267.50 F.O.B. Waltham
Extra for micrometer measuring stage.

A SET OF GAGE BLOCKS

accurate within .000008" is a necessity to provide the basic standard of measurements, from which all production starts and all measuring tools and gages, used throughout the shop are checked and set. There are large and small sets of our Ultra-Chex lines to suit all requirements.
34-block set.....$125.00 F.O.B. New York
Note also Adjustable Snap Gages.

SCHERR COMPARITOL

Gives accurate dependable readings in 1/10000". Gage blocks, plug gages, tools are checked for size, tolerance and wear. Mass produced parts such as bearings, pins, bushings, are rapidly checked without dependence upon the skill or "feel" of the operator.
Standard size 0—6".....$195.00 F.O.B. New York
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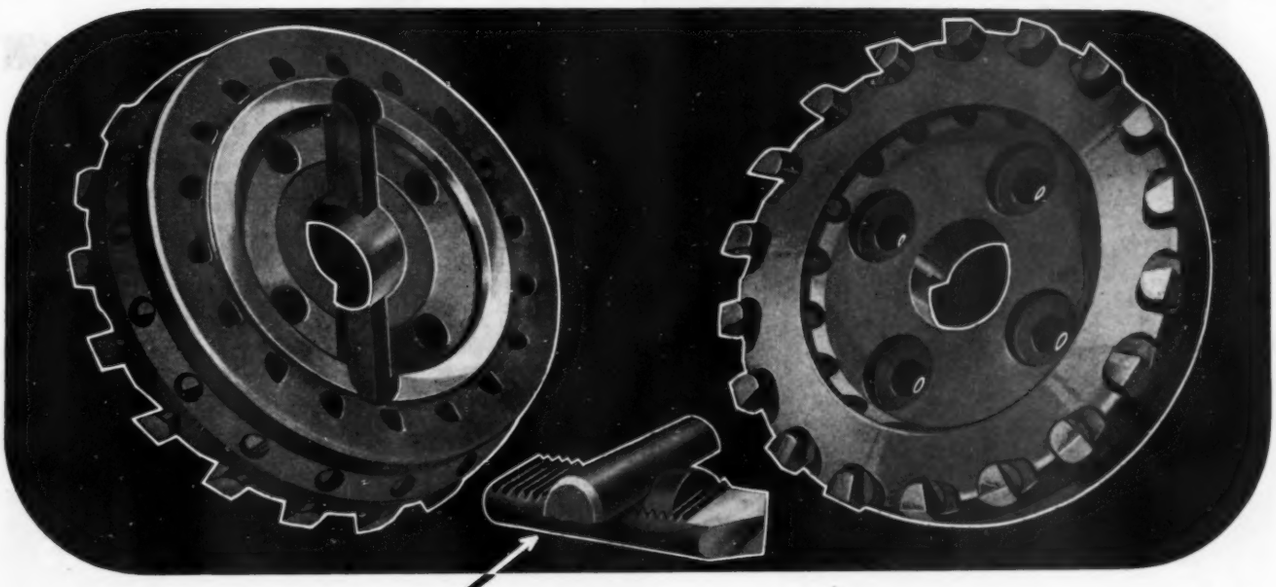
Write, wire or telephone Canal 6-1464 for quotation and delivery dates, complete literature.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

Get more out of your present Milling Machines with LOVEJOY TYPE "A" MILLING CUTTERS



with Positive Locking Blades

No milling machine should be handicapped with obsolete or inefficient milling cutters — especially at a time like this. Now is the time to make every machine count.

Lovejoy Type "A" Milling Cutters *with positive locking blades* will improve the accuracy and output of old machines that *must* remain in service, and keep new machines at the peak of efficiency.

Type "A" Mills are designed for heavy duty work and all general face milling jobs. They require the least amount of power on coarse feeds at high speeds. Not only do they require *a minimum of down-time* for sharpening, but *more than one-half the blade can be utilized.*

When orders call for increased production from your milling machines, be sure to call for Lovejoy Milling Cutters.

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TOOL COMPANY Inc.
Springfield, Vermont, U.S.A.

Please send me your latest 24 page catalog covering the complete line of Lovejoy Milling Cutters.

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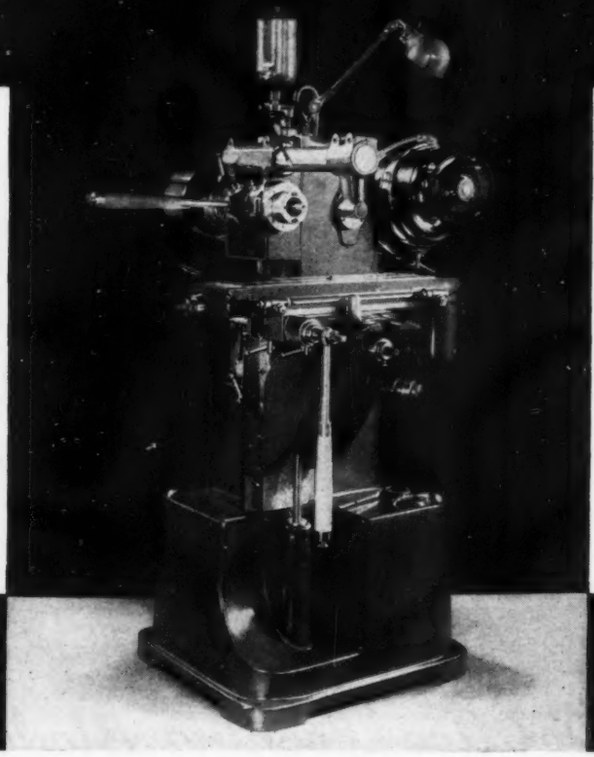
Precision, Sturdiness, High Production and Long Life

are combined in the

NICHOLS HAND MILLING MACHINE



Fast, close work on parts milling is assured by the Nichols Hand Miller. Ruggedness and in-built accuracy place this machine in the class of a modern production tool.

Valuable time savings, especially in tool room service, are offered by the "NICHOLS" because of its compactness and quick, easy set-up. Precision and outstanding versatility contribute also to the adaptability and productivity of this modern machine for tool room use.

An important feature of design which extends the utility and convenience of the Nichols Hand Miller is the vertical head. Operated by hand, the head can be locked in any position. It is also fitted with hand set depth stop. In addition to carrying the spindle, the head supports the heavy overarm for supporting cutting arbor.

Other features of this machine which has longitudinal and transverse feeds of 10" and 7" respectively are fully described in bulletin available promptly on request.

Send for Illustrated Bulletin, giving complete information

W. H. NICHOLS & SONS

WALTHAM, MASS., U.S.A.

Save Time-Cut Costs

with the

PORTER-McLEOD

PRODUCTION Cutting-Off Machine

This new 8" machine will step-up production and make such big returns in time and money savings in cutting stock for 3 inches up as to quickly return its first cost.

Here's the machine to break bottlenecks in cold metal sawing—a machine that's versatile, fast, powerful and accurate, yet easy to control and economical to operate. You can put it to work on single pieces or by nesting of bars or shapes, handle multiple unit cutting up to the capacity of the machine.

The outstanding speed of this machine is made possible by features which protect blade and work and save power. For example, due to the leverage exerted on the blade, which is supported close to its rim and pulled through the cut, buckling of the saw is prevented and accuracy as well as straight cuts assured. Friction feed insures against blade breakage.

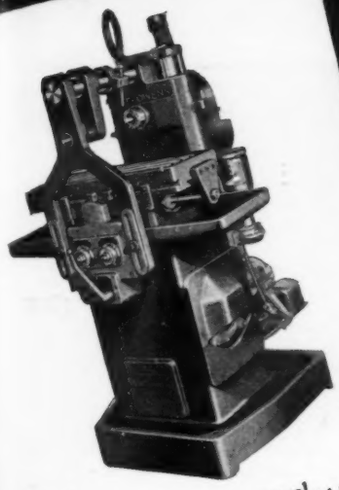
The standard feed of this machine is 3 inches and this can be stepped up for brass and non-ferrous metals.

Get all the facts about this new production machine by writing today for illustrated bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U.S.A.

MACHINE TOOL COMPANY

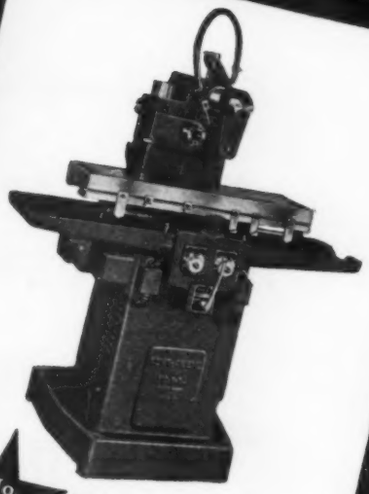


No. 1-8

8" table travel . . . 25" by 9" table . . . hydraulic table feed . . . simple automatic cycle.

No. 2-20

20" table travel . . . 42" by 12" table . . . full automatic hydraulic table feed.



No. 1-14

32" by 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

EVERY ONE A STAR!

Are you looking for Milling Machines that mill accurately, efficiently, day in and day out without trouble . . . milling machines that take your War jobs out of the tool room and put them on a production basis? *You need Kent-Owens Milling Machines!*

Rugged . . . Simple . . . Efficient . . . they provide the advantages and features that practical shop men demand. They've got the guts to do the tough jobs RIGHT! Send for latest bulletins. Contact your nearest representative or write us direct. Kent-Owens Machine Company, Toledo, Ohio.

Call on KENT-OWENS *for Milling Machines*

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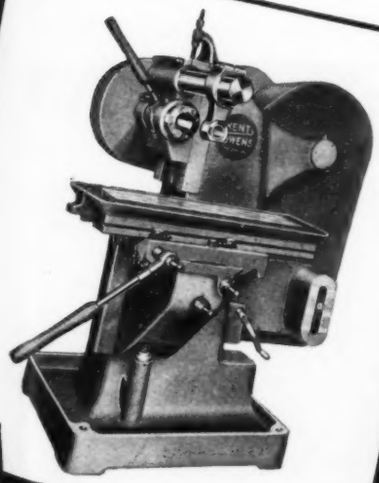
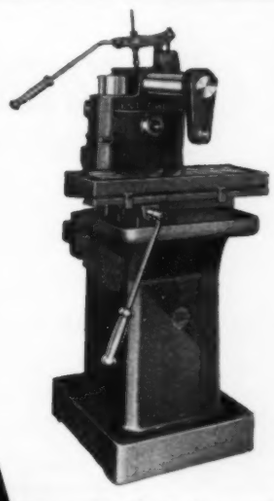


No. 2-RV

3 H. P. . . . hand feed to table and head . . . spindle speed range 100 to 1200 R. P. M.



No. 1-M

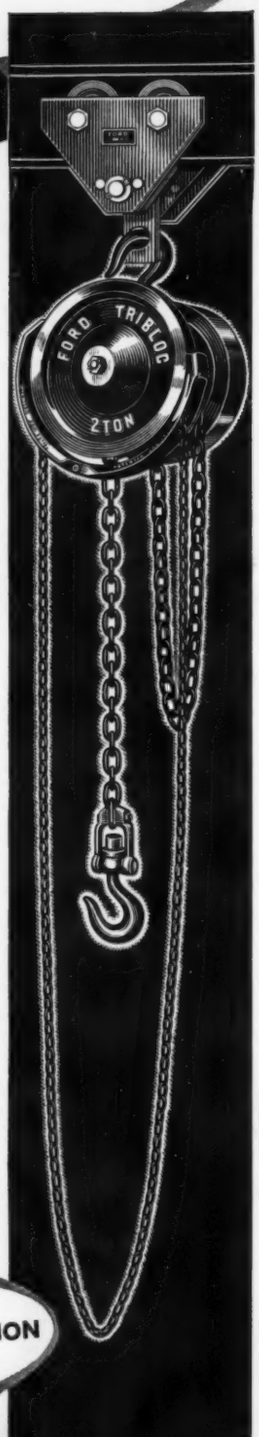
Hand feed to table and head . . . 25" by 9" table . . . 1 H. P. . . . head counterbalance is adjustable.

No. 1-V

Hydraulic vertical head feed . . . 5½" head travel . . . 25" by 9" table.

PLANT PRODUCTION NEEDS DEFENSE, TOO!

FORD Triblocs Help



Production schedules are up. Thousands of plants have a backlog of orders. American industrial production must be defended in the interest of America. The **FORD TRIBLOC SPUR-GEAR HOIST** is a tool that can help you maintain your production schedules. They are fast in operation. They are on the job constantly, ready for instant use.

FORD TRIBLOCS are low in first cost—extremely low in maintenance expense.

The **FORD TRIBLOC** is a quality spur-gear hoist. It is made throughout of high grade drop forgings and malleable castings of certified grade. Its Acco High Carbon Heat Treated chain has great strength and high elastic limit. **FORD HOISTS** must stand a 50% overload test before shipment.

Write for information on **TRIBLOCS** in ¼-ton to 40-ton capacities.

Order from your distributor
FORD CHAIN BLOCK DIVISION
PHILADELPHIA, PENN.
In Business for Your Safety

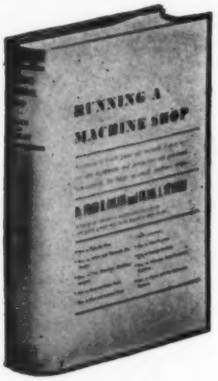
AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT, CONNECTICUT

Is your shop geared for emergency production needs?

How about *management?* Have you taken every means of improving your shop layout and handling of tools, work, records, men, etc., so as to eliminate bottlenecks and put through the greatest amount of profitable work in the busy days ahead? Here's a great new book by the famous machine-shop writers, Fred Colvin and Frank Stanley, in which owners and managers, foremen and shopmen can find practical means of straightening out all the intricacies of running a machine shop for maximum productiveness.

Just Published

Running a Machine Shop



By Fred Colvin, Editor Emeritus, *American Machinist,* and Frank Stanley, Editor, *Western Machinery and Steel World.* 403 pages, 6 x 9, 146 illustrations $3.50

HERE is the book to answer the questions that don't have to do with machine operations, yet that affect shop profits in many ways. How to set up and equip the shop, how to plan work, how to inspect and control it, where economies may be made, how production may be improved, how to keep records, how to manage men—these are the sort of important problems explained here on the basis of successful methods now in use.

Here are valuable pointers on:

—selecting machinery
—buying used machinery
—keeping machines in condition
—timesaving tool trucks
—moving work about the shop
—conveyors in the job shop
—toolroom layouts
—making the tool crib pay
—allocating machine hours
—shortening work travel
—estimating on contract work
—estimating from blueprints
—foremen's meetings
—farming out work
—planning for slack times
—modernizing a shop
—Where and when to inspect
—saving motions in assembly
—etc., etc.

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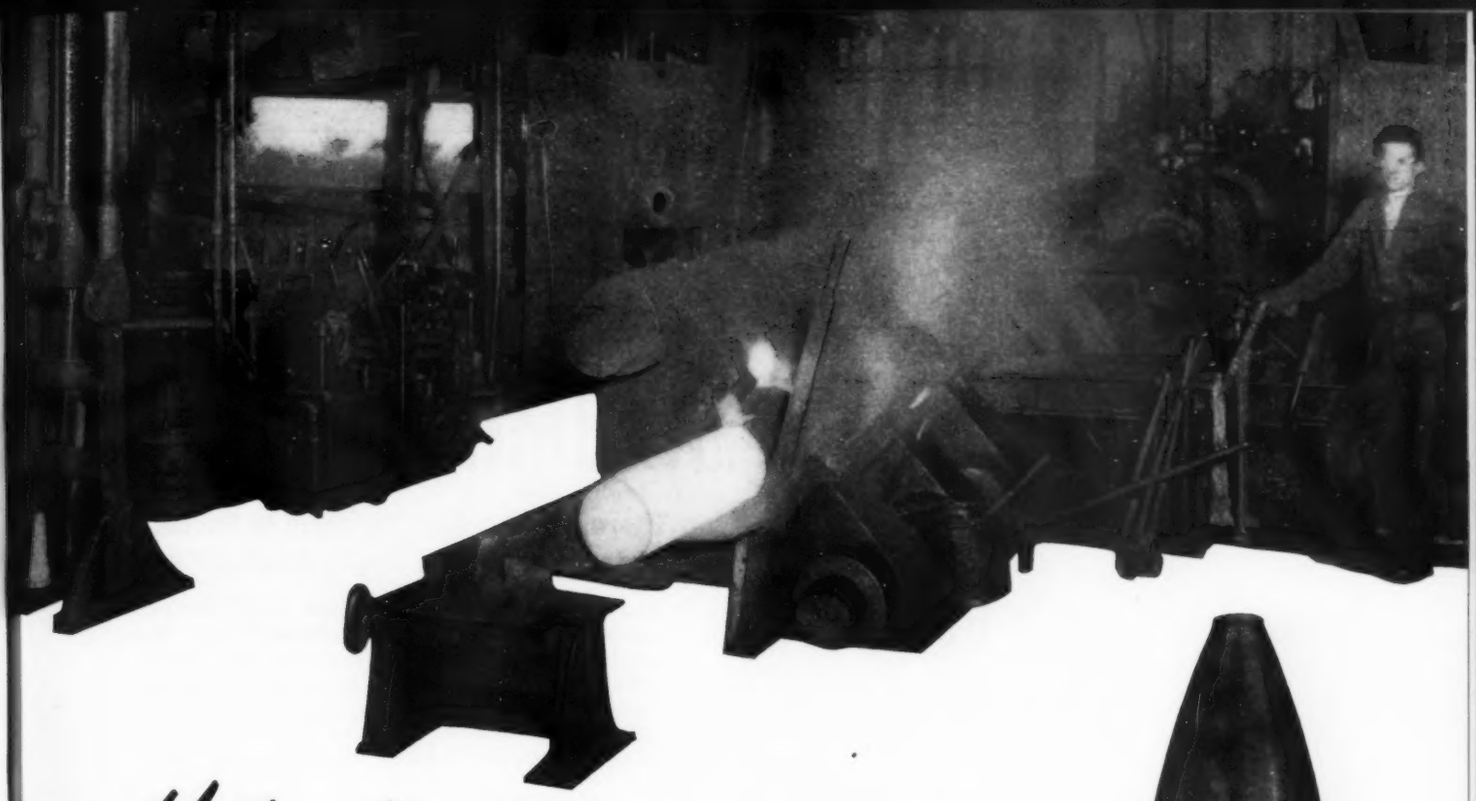

Hydraulic SHELL FORGING

...for sustained high production...fewer rejects

No shell forging process equals the hydraulic press method for sustained high production of forgings from 75 mm to 16 in. diameter. No other process can point to a lower percentage of rejects.

Tried and proven in World War I, hydraulic shell forging methods have been substantially improved by new developments in the design of dies, presses, pumps and press operating valves. For every stage in the process—billet-breaking, piercing, drawing and nosing—there's a Southwark press to help you do a better job; to give you more production and less rejects.

Southwark also builds high pressure pumps, all types of valves and accumulators; engineers plant piping and forging plant layouts. Whether you need a complete shell forging plant or a single quick-acting operating valve it will pay you to secure Southwark's recommendations *first.*

Baldwin Southwark Division of The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco, California.

CASE STUDY

105-MM SHELL FORGING

A plant using a number of Southwark shell forging units reports that production of one of these units in an 8-hour turn was 1798 forgings, with 25 rejects caused either by defective material, short billets or other minor difficulties. *This is an average of better than 221 forgings an hour.*

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What is the proper kind of gage for a specific type of work? How are gages constructed? How are they used? Fred Colvin, out of his wide and intimate experience, has set down in a practical, workable manual the essential facts about gages of all types—how they are made, how to use them, which types are best for specific jobs, how to use them in inspection work.

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Gages and Their Use in Inspection

By Fred H. Colvin
Editor Emeritus, *American Machinist*
157 pages, 5½x8, 71 illustrations, $1.50

This book describes all types of gages, from calipers, Verniers, Micrometers, Measuring Blocks, etc., up to the latest electrolimit gages. Tolerances, limits, and allowances are carefully defined and explained, and many practical kinks and suggestions on inspection are included.

Here is what the book covers—

1. Gages and How They Are Used
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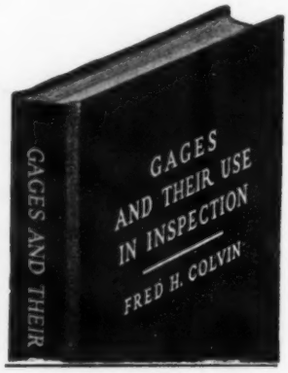
7. Threads and Thread Gages
8. Special Types of Gages
9. Interchangeable Manufacture and Inspection
10. Salvaging and Selective Assembly
11. Kinds of Fit



"A thorough understanding of gages and their use will make it easier for both workmen and inspectors, and it may easily open the way for a workman to graduate from the machine to the inspection department."

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Spring tempered COLLETS

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★ Use it as a single-action, double-action or triple-action press . . . the job will be done with minimum change-over, spoilage and production costs. This versatility has won the H-P-M Fastraverse Triple-Action Deep Metal Drawing Press an important place in today's all-out production of the Nation's aircraft and armament plants.

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District Sales Offices: New York, Syracuse, Detroit and Chicago. Representatives in Principal Cities.

The 200 ton H-P-M Fastraverse triple-action press shown above is drawing oil tank collars for the Douglas C-47 troop transport, from .051"—3S0 stock —production 125 per hour. Other parts are typical of the variety of work made on this press in the Douglas plant, largest piece being 23 5/8" long, 16 1/2" wide, drawn 2 9/16" deep.

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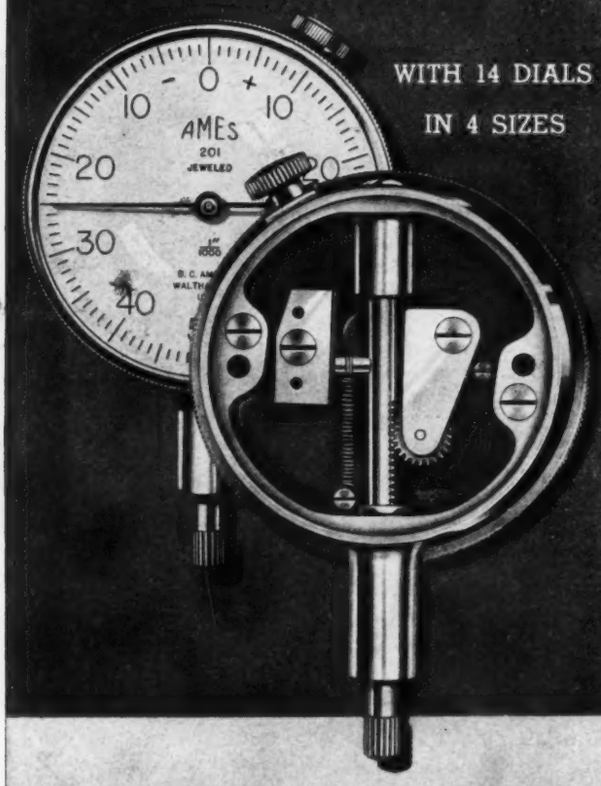

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IN 4 SIZES

A COMPLETE NEW SERIES

These Dial Indicators have all the desirable features for measuring and checking accuracy. Four sizes to American Gage Design Committee specifications. Fourteen different dial numberings. One-piece, drop-forged cases and stems. Wire attached bezels. Cup-shaped dials that need no springs beneath. Pinions and staffs of hardened steel, ground for accurate fitting and long wear. Various styles of backs and contact points. The best and most effective shock-absorbing wheel assembly, optional.

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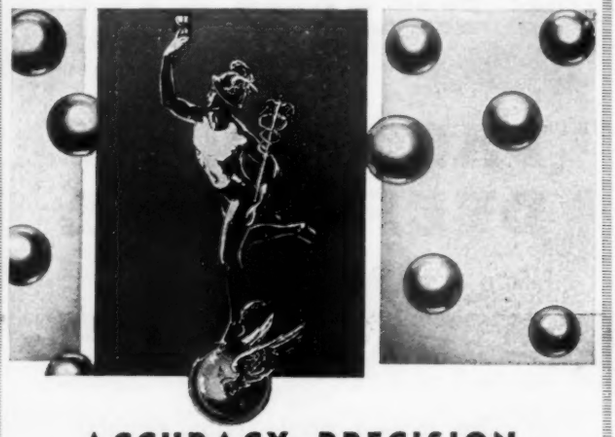

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All WATERBURY STEEL BALLS are of uniform hardness which extends to the center of each ball. Made of high carbon chrome alloy steel highly finished.

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THE WATERBURY STEEL BALL CO., INC.
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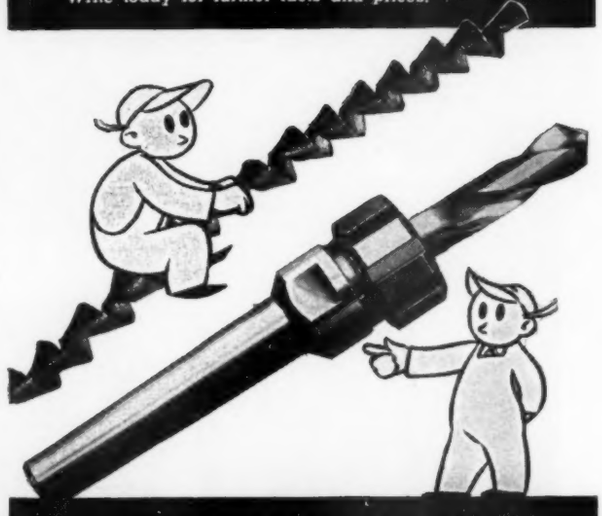
LOOK AT THIS CHIP!

A 2-inch diameter drill in a Universal collet chuck turning only 160 revolutions per minute cut the chip here illustrated. And during this drilling operation the drill did not slip in either a longitudinal or radial direction in the collet chuck. In addition to gripping as strong as solid steel itself, Universal chucks have ground threads and ample room for tool feed out. Write today for further facts and prices.



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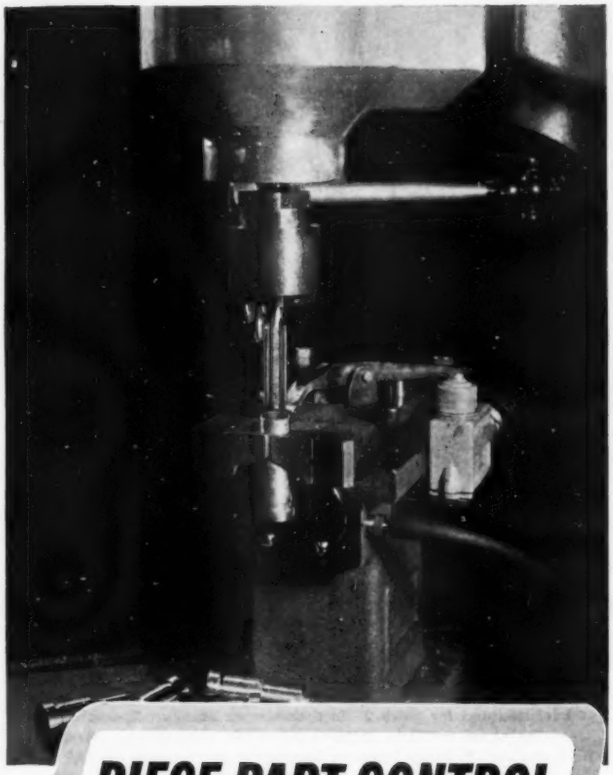
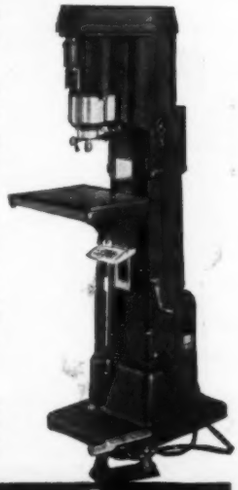


PIECE PART CONTROL Helps You Control Costs

THIS Air Vise Fixture with Piece Part Control —a Haskins development—greatly speeds up the precision tapping of these time fuse bodies of cold rolled steel. The operator places the part in the fixture to start the tapping cycle and everything else is automatic—even the ejection of the tapped part!

Haskins developed fixtures are one important reason why Haskins Tappers are making such valuable contributions to war production now—and why these same *standard* machines can be so quickly and inexpensively converted to private industry production when Victory is won! R. G. Haskins Company, 2761 W. Flournoy St., Chicago.



NEW BOOKLET — *"Holding Fixtures for Haskins Tapping Machines" — contains many new ideas. Send for a copy.*

HASKINS

HASKINS *Precision* TAPPING EQUIPMENT

Cutting a combination of both hard and soft steel without changing speed or type of wheel

The **CAMPBELL ABRASIVE CUTTING MACHINE NO. 302,** above, completes with one clean, fast, accurate cut a production job that formerly required several steps.

And—note—it is cutting flat stock that contains *both* hard and soft steel *without changing speed or type of wheel.*

There you have another example of the ability of **CAMPBELL ABRASIVE CUTTING MACHINES** to fit the great need today. That is why you find them on many important war production jobs, including—

- **Aircraft**
- **Aircraft Engines**
- **Propellers**
- **Army Trucks, Cars and Tanks**
- **Machine Guns, Bombs, Shells**
- **Small Arms Ammunition**
- **Projectiles**
- **Field Telephones**

Ask to have a Campbell Engineer make a study of *your* cutting problems. This involves no obligation and you may find his suggestions point to definite economies, greater production and better cutting.

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

Campbell ABRASIVE CUTTING MACHINES

AMERICAN CHAIN & CABLE COMPANY, Inc.
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BAYARD

SKILLED *hands*

• We are proud of our ability to undertake the designing, planning and manufacturing of machinery intended for unique and special purposes. Our skilled hands are adept at every phase of the job.

• We have responded to the emergency that exists with enlarged facilities and increased capacity, and are filling individual orders to the best of our ability. Look for the machine that bears the "Bayard" name to measure up fully to highest standards of accuracy, precision, quality.

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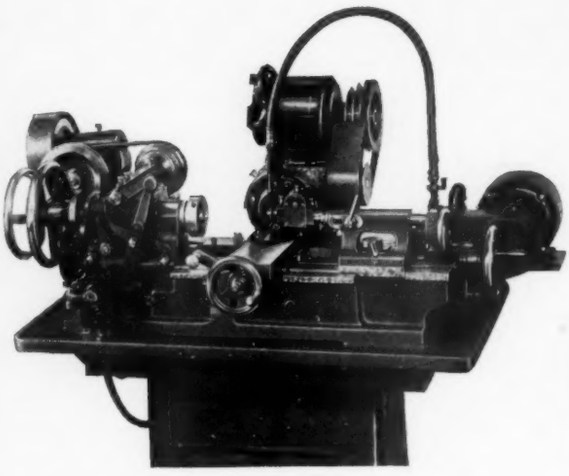


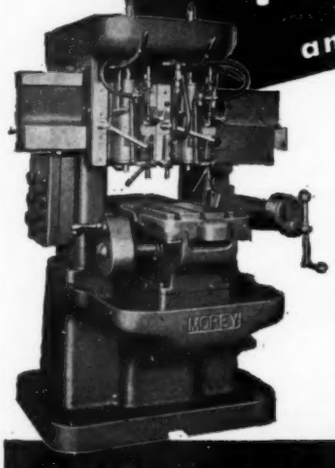
WALTHAM THREAD MILLER
WITH 3 MOTOR DRIVE

A semi-automatic machine for production or tool room service. It is best adapted for work 2" in diameter or smaller. Special equipment for short multiple cutter work with cam shaft control can be furnished. A cutter head for internal work can also be supplied.

WALTHAM MACHINE WORKS
HIGH STREET WALTHAM, MASS.

Preloaded Precision Bearings for Spindles

MOREY 12M
HIGH-SPEED VERTICAL PROFILER and MILLER



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Engine and bench lathe, milling and drill press work.

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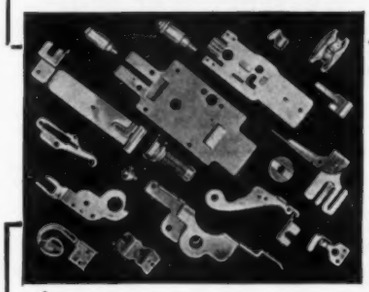

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DON'T WAIT FOR IT TO COME TO YOU

The old adage may work for the mouse-trap manufacturer, but to the metal-working shop seeking sub-contracts it is an antiquated and dangerous way of thinking. True, the prime contractor may need your help, but today he is busy and cannot search for you. Furthermore, in the tremendous maze that constitutes metal-working America, you may well be overlooked—and better-known if not better-equipped facilities get the business.

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Company .....
Address .....

MAIL THIS COUPON TODAY FOR COMPLETE INFORMATION

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(See also "Selling Opportunities" Offered)

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MECHANICAL ENGINEER—Experienced and technically proficient for factory development. Must have knowledge in development of mechanisms and machinery, including die work. Plant located near Newark, N. J. Good opportunity for right man. State full particulars, age, salary, experience, etc. Address P.O. Box 647, Church St. Annex, New York, N. Y.

WANTED—Tool and die designer on small parts, give full particulars, experience, education, salary, etc. P-225, American Machinist, 330 W. 42nd St., New York, N. Y.

EXPERIENCED, CAPABLE ENGINEER and Designer wanted, one familiar with horizontal boring machine design. Give resume of education, experience, etc. Write P-226, American Machinist, 330 W. 42nd St., New York, N. Y.

AUTOMATIC SCREW MACHINE Supervisors —Foremen—Setup Men—Inspectors—Operators for war work. Willing to pay for the best. Men who can take charge and want to advance with our expansion. Write to Cincinnati Ball Crank Co., Cincinnati, Ohio.

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TOOL DESIGNER AND DRAFTSMAN, experienced in the designing of Jigs and Fixtures, also having wide experience in estimating the cost of manufacturing Jigs, Fixtures, Special Tools, Special Machinery and Machining of parts for machine tools in addition to having had experience in routing and planning work going through factory. Give full particulars regarding your past experience, where you have been employed, length of time of employment, monthly salary desired and how soon would you be prepared to report for work. P-228, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

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SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 32 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

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INDUSTRIAL ENGINEER, employed, with comprehensive management and production experience, metal products, desires permanent position. University graduate. Married. PW-208, American Machinist, 330 W. 42nd St., New York, N. Y.

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WORK WANTED — For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on the page Facing the inside back cover.

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★ Direct factory representatives in the United Kingdom for leading United States Machine-tool manufacturers.

Started in 1930 our unique policy of pushing American machine-tools exclusively, ensures 100% results.

Being Practical and Technical Engineers, we ensure efficient outputs and service.

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Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

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All inquiries will be treated in strictest confidence.

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2¼, 3¼ and 4¼ Gridley automatics
24 x 48 x 18' J. J. McCabe
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Cincinnati Duplex Miller
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Two—18" Dill slotters, arranged for motor drive.

Immediate delivery

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Any size, width or capacity

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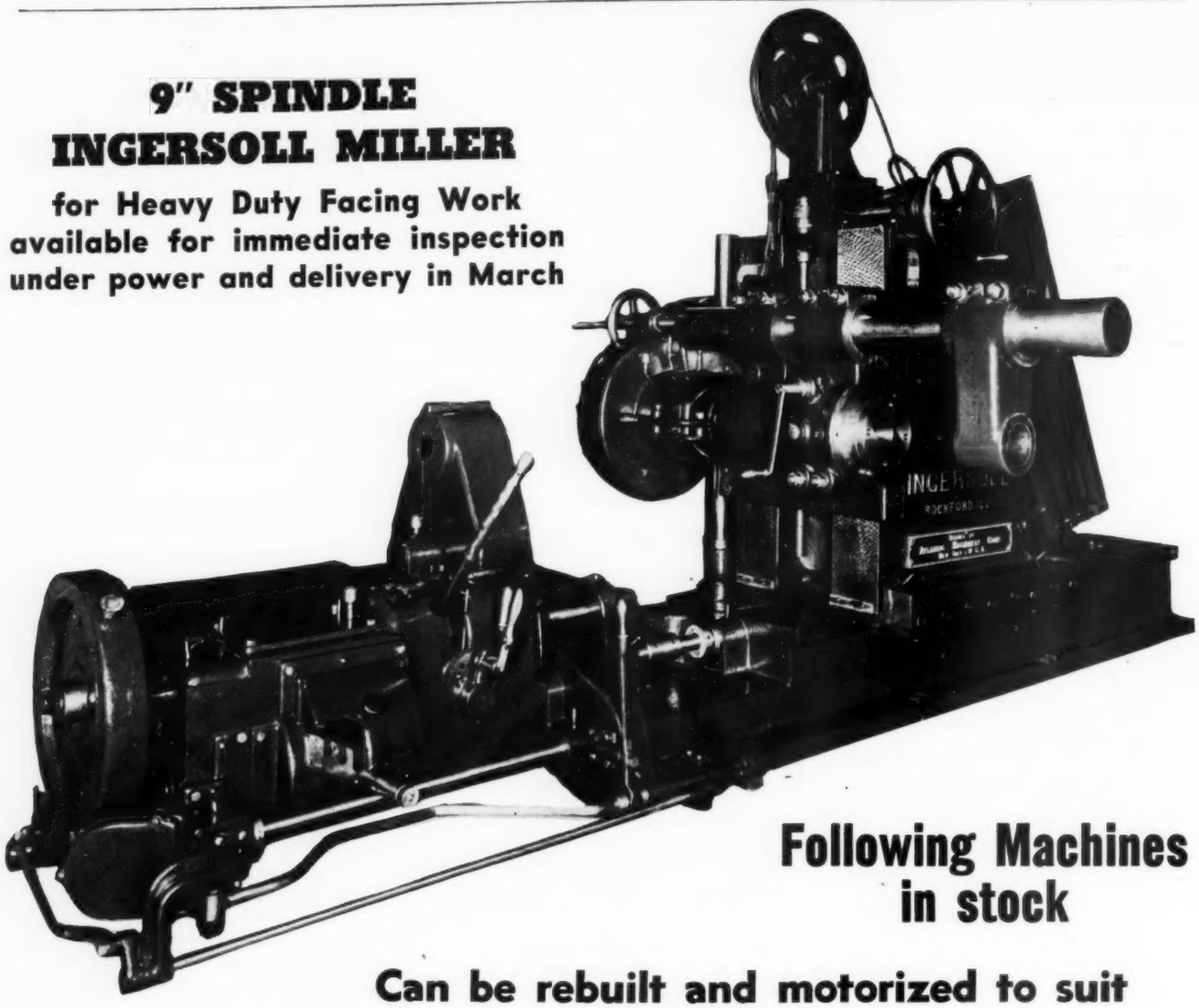
for Heavy Duty Facing Work available for immediate inspection under power and delivery in March



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Can be rebuilt and motorized to suit your requirements:

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1—42"x42"x13' 6" Pond 2-heads, MD
1—47"x40"x12' Gray 2-heads, MD
1—72" Morton Draw Cut Portable, MD

BORING MILLS

1—48" Niles Wheel Borer, MD
1—7" & 5" Dbl. Spindle Cyl. Borer, MD

MILLERS

1—9" Spindle Ingersoll Horiz. Facing Mill
1—37"x37"x14' Ingersoll Adj. Rail Slab
1—#2V Potter & Johnson Vertical
3—28" Cincinnati Semi-Automatics
3—24" Cincinnati Automatic Facing Millers Hydraulic Feed
1—24" Cinc. Duplex Miller
1—P.&H. Vertical Keyway Miller

GRINDERS

1—20"x96" Landis Cyl. Motor Drive
1—24"x96" Landis Cyl. Motor Drive
1—30"x240" Landis Cyl. Motor Drive

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1—36" G&E Auto. Gear Cutter
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2—Barber-Colman Single Overarm Hobbers

NEW MACHINES available for immediate delivery!

SURFACE GRINDERS	HAND MILLERS	12" SLOTTERS
Precision Type—6"x12"x18" capacity	Heavy Duty—High Speed	Dual Control—Motor in Base

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3¼" Gridley Single Spindle
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36" B&S Turret, chucking

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One Spindle Avey B. B.
One Spindle H&W B. B.
Two Spindle Rockford
Two Spindle Prentice
Four Spindle Rockford 23"
Bickford Rail Drill
Four Spdl. Foote-Burt No. 4
No. 39 Natco Str. line
No. 12 P&W Rect. Head
No. 3 Bausch 14 spindles
30" Snyder Upright S. H.
No. 25 Foote-Burt heavy
No. 23 Foote-Burt high duty
No. 1SS Garvin Duplex
Two Spindle No. 3 Bement #5 taper
Six Spindle Foote-Burt boring

GRINDERS

24" Ingersoll face mill
No. 1 Bridgeport D.C. motor
No. 6 Webster Perks polishing
8"x18" Modern, plain
8"x36" B&S No. 12
16"x50" Norton, plain
18/30"x96" Norton Gap
No. 60 Heald
14" P&W Surface
12" Besley Disc
18" Besley Disc
22" Besley Disc
24" Besley Disc
16" Gardner Ring Wheel
18" Gardner, sizing
18" Besley, sizing

GEAR CUTTERS

18"x12" B&S spur & bevel
24"x8" B&S spur
24"x9" G&E spur
36"x10" B&S spur
50"x8" G&E spur & bevel
60"x12" B&S spur
60"x16" G&E spur & bevel
64"x20" G&E spur
90" P&W spur & worm
24" Adams Hobber
6" Bilgrim Generator
16" Bilgrim Generator
15" Gleason Generator

LATHES

18"x8' Reed-Prentice, G. H.
18"x44"x8' Putnam Gap
24"x10' Lodge Shipley, G. H.
30"x15' Lodge Shipley
32"x14' Pond, G. H.
36"x12' Pond, G. H.
48"x16' Bement, cone
32"x21' N. B. P. heavy turning
48" Tindell, Crankshaft
20' Gleason Pit
13"x8' Automatic threading
18"x15' N. B. P. Carboloy

MILLERS (PLANER TYPE)

10"x39" P&W Duplex, light
24"x30"x10' Ingersoll, Vert. Spl.
30"x30"x10' Newton, Horiz. Spl.
48"x30"x14' NBP Horiz. Spl.
4" P&W Spline
#1 Knight Mill and Drill
#10 N. B. P. Vertical

PLANERS

24"x24"x6' Pond, 1 head
36"x36"x12' Pond, M.D.
36"x36"x12' Pond, D.C., M.D.
36" Newton Rotary, M.D.
42" Newton Rotary, M.D.
60" N. B. P. Rotary, M.D.

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30" H&W Sensitive
36" Carlton Sensitive
5' Prentice Plain

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10-ton H&W Dieing
400-ton N. B. P. Wheel
20" throat H&J Punch
24" throat EF Cleveland
60" throat Long Alstatter
20" EF Cleveland dbl. end
RT40 Naumann, beam
20" throat Cleveland double end

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7" cap. Newton M.D.
9" cap. Newton, pneumatic clamp
12" cap. Newton No. 574
4" cap. Campbell 302 Abrasive
Radiac Abrasive Saw, 3 H.P. mtr.

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3" Pilton, belt drive
12" New Haven
12" Sellers
14" Scott, heavy
30" Baker, draw stroke
60" Newton, portable

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No. 2 Woods tilting turret
18" W&S fox type
2¼"x26" Greenlee
Millholland Staybolt Machine

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48" Putnam Car Wheel Boring
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No. 4 Putnam Axle Lathe
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Bridgeport Journal Truing
42" NBP Wheel Lathe
42" Putnam Wheel Lathe
48" NBP Wheel Lathe
85" Putnam Wheel Lathe
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2" Landis, double bolt threader
4" & 16" Baker vertical tappers
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200# Bradley Hammer
Air Compressor, 10x10 Curtis
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No. 3 Manville Bolt Trimmer
Broaching, No. 3 LaPointe
Threading, 1½" Landis, single
1½" Ajax Upsetter
2" Acme Upsetter
Trimmer, No. 3 Manville
Brake, 8' Pexto Cornice
Cut Off, 3" Hurlburt Rogers
4" & 5" P&W Centering
6'x¼" Pyramid Bending Rolls

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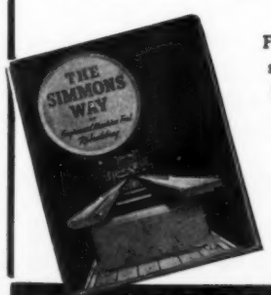

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Write for a rebuilding estimate on YOUR tools.

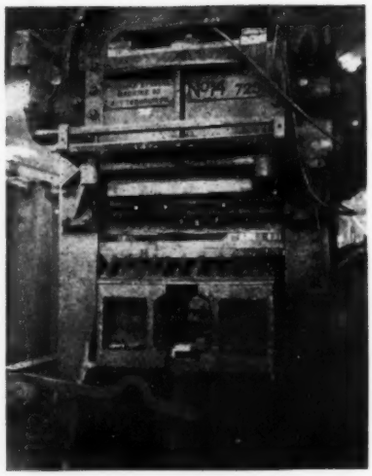
SIMMONS ENGINEERED *Machine Tool* REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY, ALBANY, N. Y.
New York Office: 149 Broadway

DEPENDABLE MACHINES

"FALK" REBUILT MACHINERY

WIRE, WRITE OR PHONE



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Complete with Tables—Now fitted as Plate Shear.

Capacity 42" wide 1¼ thick.

MILLING MACHINES

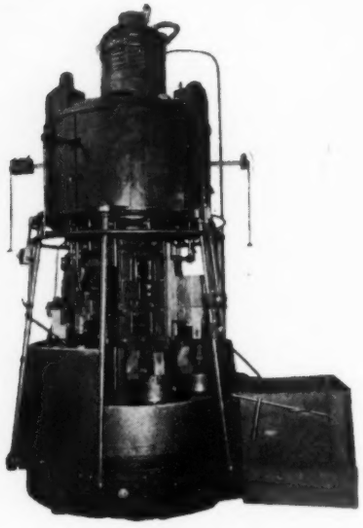
#3 B. S. Universal Belt Feed.
#1½ Cincinnati Plain
#25 Becker Power feed
#2 B.S. Plain, Belt feed
#½ Van Norman Duplex
#0 Van Norman Duplex
#1—Cleveland Vertical (New)
#48 H Index Vertical (new)
#7 H. BECKER Lincoln (2)
#12—Pratt & Whitney Lincoln (4)
#4 Hendey Lincoln (2)
#13 Brown & Sharpe Prod.
#12—P.W. Duplex Lincoln
#2 Garvin Duplex Lincoln
#2 P. W. Hand Miller (6)
#4—Burke Bench
#1—Cincinnati Plain

RADIAL DRILL

5 ft. American Radial Drill

14" BULLARD
BULLARD MULT-AU-MATICS

2 14' Bullard Mult-Au-Matic 6 Station, M.D.



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24" Stockbridge
20" Ohio
16" Smith & Mills
17" Smith & Mills
14" Gould & Eberhardt, High Duty
7" Rhodes with vertical head.
26" Niles-Bement-Pond, Motorized.
15" Smith & Mills Single Geared.
12" Gould & Eberhart.

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42"x36"x12' Cincinnati, two Heads, belt drive. Rebuilt.
28"x32"x8' Wilson, single head, M.D. Rebuilt
24" NILES-BEMENT-POND Planer-Shaper, Excellent for Die Blocks. Motor Drive.
48"x48"x16' Niles-Bement-Pond 4 Heads Belted Motor Drive.

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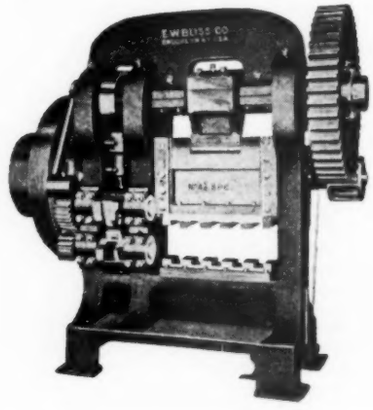
24" Gisholt, 3⅝" hole
#2A W&S Universal, Chucking
#2A W&S Univ., Bar Feed
2¼x24" J&L
3x36" J&L
#1 W&S, ⅝" collet capacity
#2 W.S. G.F.H. Hollow Hex
#1 W.S. G.F.H. Hollow Hex
#2½ Garvin G.F.H. Tex Turret 1¼ Cap.

PRESSES

No. 18 Bliss, OBI
No. 19 Bliss, OBI, 3
No. 19C Bliss, OBI
No. 20 Bliss, OBI (10)
No. 20B Bliss, OBI
No. 21 Bliss, OBI
No. 21½ Bliss Grd., OBI
No. 75 Toledo Plain
No. 75 Toledo Geared
No. 3 Consolidated
No. 14 Stoll
No. 3 American Can Co., OBI
No. 3 Adriance
No. 37½ Bliss S.S. Plain
No. 5 American, S.S. Tie Rd.
No. 3B Marquette Grd; M.D.
No. 702 Bliss Flat Trimming
No. 4 Bliss, Back Flywheel
No. 50 Perkins Dble. Crank Pl
No. 4 Baxendale (3) OBI
No. 6 Waterbury D.B. II
No. 75½ Bliss Geared; S.S.
No. 24 Adriance Horn Press; 2½" stroke
No. 20 Waterbury Dble. Acting
No. 8-IL Max, Ams Horn—No. 8-16 Verson 350 Ton —8" stroke, all steel.
No. 59 Toledo S.S. Tie-rod 8"
No. 25 Stoll Horn Press
No. 30IS Bliss Auto. Gang Press
25-ton Henry & Wright
No. 93D Toledo S.S. Solid Frame Dble. crank; 4" stroke, grd.
No. 166 Consolidated
72" Cleveland Punch, throat 1¼ thru 1¼, motor driven



"BLISS" THREE-COLUMN FORGING PRESS, No. 4 With Positive Clutch Code Word, Realishad

This press as shown, has machine steel upper and lower die holders, and a crank on end of main shaft operates two sector gears attached to rocking die holders for rolling tapers on claw hammers and other similar work. Axes—spring leafs, etc.

Every Item Guaranteed

FALK

Partial Listings Only

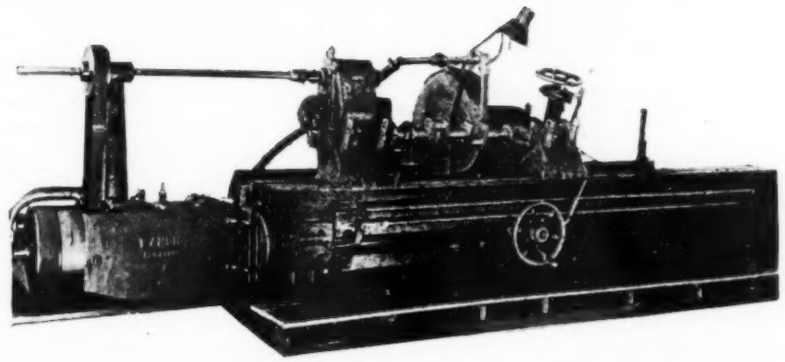
MACHINERY

MACHINERY

18 WARD STREET

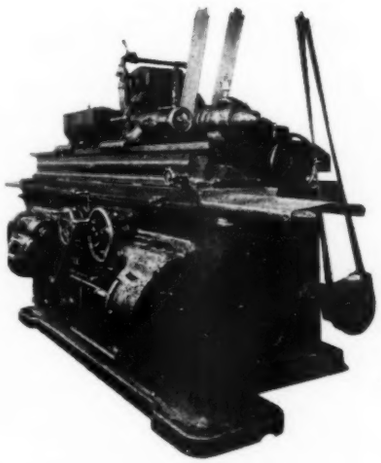
DEPENDABLE GRINDERS

"FALK" REBUILT MACHINERY

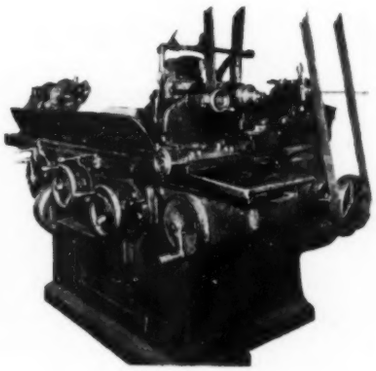


1—2"x120" LANDIS PLAIN GRINDER

Self contained motor drive. Now in operation—ready for immediate delivery.



1—#14 B&S CYLINDRICAL GRINDER —10" x 48" Belt Drive—Very fine condition, ready for immediate delivery.



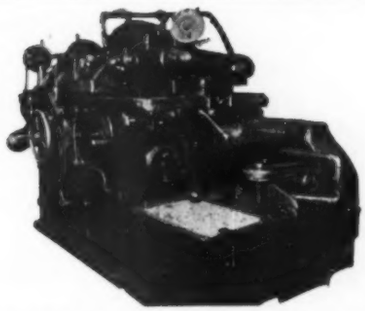
1—#2 CINCINNATI UNIVERSAL CYLINDRICAL GRINDER

12"x36" belt drive complete—very fine mechanical and operating condition. Immediate delivery.

GRINDERS

Landis 20x120 Plain, self-contained
Brown & Sharpe #14, 10"x48", Plain
Landis 10x36, Plain
Cincinnati 12x36 Plain, M.D.
Cincinnati Univ., Belt Drive, #2
Heald #216, 8" Rotary Ring Grinder, with Excello Spindle. Motor Drive.
Covel-Hanchett 40" Vertical Rotary Surface Grinder, Motor Drive.
Gardner #14 Double Opposed Disc. Grinder, BB
Gardner #8 Double End Ring & 40" disc Grinder, with Universal Tables.
Badger 12" Disc Grinder, Ball Bearing, double end, Universal Tables, belt drive.
#1—Iroquois Universal
#2—Norton Universal Tool & Cutter
#1—Le Blond Universal Tool & Cutter

CRANKSHAFT GRINDER
Landis 16"x72", complete with Universal Heads. Belt drive. Ser. No. 3483



10 x 36 Landis Plain Grinder Self contained. Complete with Chuck. Back Rests and Centers.

LATHES

42"x25' PUTNAM Triple Geared, Screw Cutting Engine Lathe; Plain Change; Internal Geared, Face Plate Dr.

25" LeBlond, Heavy Duty, 12' bed
26" Greaves-Klusman, 16' bed
26" Crawford-Erie, 12' bed
22" American, 8' bed
20" Davis, 10' bed
20" Davis, 8' bed
18" Lodge & Shipley, 10' bed
18" Mueller, 8' bed
18" Chard, 8' bed
16" Lodge & Shipley, Grd. Hd., 6' bed
16" American, Grd. Hd. 6' bed
16" Reed, 6' bed
16" Reed-Prentice, 10' bed
17" Sidney, 8' bed
16" Pratt & Whitney, 6' bed
14" Lodge & Shipley, 6' bed
13" Pratt & Whitney, 6' bed
3½x48" Fitchburg Lo-swing Lathe

Send Us Your Inquiries

FALK COMPANY

MERCHANTS

ROCHESTER, N.Y.

LOOK! WE MAY HAVE THE TOOL TO SOLVE YOUR PROBLEM

BROACHES
NO. 1 LAPOINTE, screw type.
NO. 2 LAPOINTE, screw type
NO. 2 STANDARD screw type broaching press.
NO. 3 LAPOINTE of HUDSON, screw type
NO. 3 J. N. LAPOINTE double screw type.
NO. 3 AMERICAN high speed, rack type.
NO. 4 LAPOINTE of HUDSON, screw type.
2 ton AMERICAN vertical.

BULLDOZERS
NO. 5 WILLIAMS & WHITE, 12½"x63" crosshead.
NO. 6 WILLIAMS & WHITE.
NO. 29 WILLIAMS & WHITE, 16 x 89½" crosshead.

DIAMOND BORERS
Two spindle COULTER vertical. For single or double spindle operation. Motor in base type.
EX-CELLO-O 9 spindle radial.

PRODUCTION LATHES
9"x14" Porter Cable. 13"x6' Automatic threading.
16"x5' Monarch Mfg.
16"x10' LeBlond Mfg.
18"x7½' Wickes Mfg.
20"x8' Wickes 12 speed geared head Rapid Production.
17"x10' LeBlond geared head with 2 carriages.
34"x11' Wickes center drive crankshaft.
Melling camshaft 4 cyl. motor.
Melling crankshaft 6 cyl. motor.

PRESSES, ARBOR, HYDRAULIC, ETC.
30 ton ATLAS NO. 76, double housing power arbor or forcing.
3 & 12 ton FOX Superflex.
8 20 ton GENERAL FLEXIBLE.
NO. 2 WATSON .STILLMAN hydraulic shaft straightening.
NO. 3¾ GREENERD arbor.

SHAPERS
7" RHODES.
18" WALCOTT.
22" OHIO.
24" ROCKFORD.
36" MORTON draw cut.

ENGINE LATHES
14"x6' Hendey.
14"x6' LeBlond.
14"x8' Monarch.
14"x8' Lodge & Shipley.
18" (20)x8' American, T.A.
18"x8' Monarch.
18"x8' Whitcomb Blaisdell.
19"x8' Sidney.
20" (22")x10' Davis.
24"x10' Reed Prentice.
24"x10' Schumacher & Boye, tapper attachment.
24"x10½' New Haven
24"x12' Lodge & Shipley.
24"x16' Schumacher Boye, taper attachment.
36"—43"x18' New Haven.
36"—47½"x21'6" Wickes.
16"x6' Cincinnati.
16" (18") x8' American.
16"x10' Monarch.
18"x8' Walcott.

TURRET LATHES
No. 2 Wood tilted.
14" swing Warner Swasey.
21"x28" Steinle.
17½" swing No. 4 Bardons & Oliver.
2¼"x24" Jones & Lamson.
3"x36" (14½" swing) Jones & Lamson, cross feeding headstock.

GRINDERS, MISCELLANEOUS
5" x 7" PRATT & WHITNEY worm or thread grinder, cam feed type.
HUTTO honing machine, type MD 583.
NO. 6 BRYANT internal.
NO. 50 HEALD hydraulic cylinder.
Type 15 NORTON vertical lapping machines.
NO. 524 MUMMERT DIXON radial or swing frame, 5 or 7½ H.P.
NO. 575 HAWES continuous rod and tube polisher.
10" x 50" NORTON cam shaft grinder.
17" x 36"-48" NORTON, Type B, Model 84 hydraulic cranking grinder.
16" x 4" NORTON style D snagging.
30" x 4" NO. 41 RANSOM double end, motor on spindle.
30"x84" DIAMOND face and edge, motor drive.
14" PRATT & WHITNEY, ball bearing vertical surface.
20" x 12" x 50" Safety Emery Wheel surface
NO. 1 SELLERS lathe & planer tool.
2¼" NO. 5 OLIVER drill.

PRESSES
NO. 21½ BLISS OBI, geared, 2¾" stroke, 6700 lbs.
71 ton WATERBURY FARREL OBI, 4" stroke, 8300 lbs.
NO. 62 BLISS openback non-inclinable, 8" stroke.
NO. 76 TOLEDO, open back non-inclinable, geared, 3" stroke, 7500 lbs.
40 ton No. 6 series A WATERBURY FARREL openback, non inclinable, 1½" stroke.
28", NO. 71 SWAINE double crank, 3" crank, 1" stroke.
NO. 4 MASSILLON straight side, geared, 5" stroke, 9650 lbs.
NO. 7 ROCKFORD straight side, geared, 3¾" stroke, 9000 lbs.
NO. 8-7 ZEH & HAHNEMANN straight side, geared, 2¾" stroke, 6000 lbs.
NO. 55 TOLEDO straight side, 3" stroke, 8300 lbs.
NO. 55½ TOLEDO straight side, 5" stroke, 7425 lbs.
750 ton BALDWIN SOUTHARK triple action hydraulic operated toggle drawing press. Between uprights 11'-10½", shut height 84", strokes 37", 36" and 12". Weight 500,000 lbs.
NO. 796¼D TOLEDO 108" double crank, toggle drawing, 201,000 lbs.
NO. 180 TOLEDO, 60" x 60" single crank, double geared toggle drawing, 12"-13" crank, approx. weight 189,500 lbs.
NO. P2 FERRAUCUTE, punching, 1" stroke, 2580 lbs.
NO. 2 STANDARD MACHINERY CO., screw press, 12" stroke, 5200 lbs.

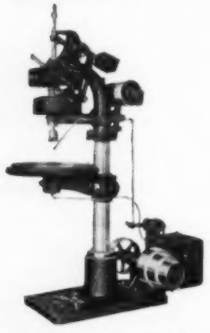
DRILLS, RADIAL
All have single pulley or motor drive and tapping attachment unless otherwise noted
3' CINCINNATI, Old style without gear box but in good working order.
4' MUELLER.
6' DRESES, full universal.

GRINDER, CYLINDRICAL, PLAIN AND UNIVERSAL
6" x 32" NORTON.
10" x 24" LANDIS.
10" x 36" CINCINNATI UNIVERSAL.
10" x 36" NORTON.
10" x 50" NORTON.
12" x 36" LANDIS self contained.

Many other good tools; phone, wire or write, giving details of your job.

MILES MACHINERY CO. - - - Saginaw, Mich.

GARVIN AUTOMATIC TAPPERS



1—#1 capacity 1/16"— ½" in cast iron
10—#2 capacity ½"— ¾" in cast iron
10—#2-X capacity ¼"— ⅞" in cast iron
2—#2BG capacity ½"—1¼" in cast iron

Priced very low for immediate disposal

LOUIS E. EMERMAN & CO.
1761 Elston Ave. Chicago, Ill.

LATHES
26"x10' LeBlond, Universal Crankshaft

MILLING MACHINES
2" Pratt & Whitney spline (duplex) (Double)
No. 1½B Kearney & Trecker Vert.
No. 1B, Brown & Sharpe Plain

BORING MILLS
36' Bullard New Era M.D.

TURRET LATHES
Goss & De Leeuw Chucking, 6"x6½"
3¼"x36" Acme flat Turret

GEAR MACHINERY
No. 61 Fellows Gear Shaper, M.D.
No. 4—48" Brown & Sharpe Gear Cutter
Lees Bradner Gear Grinders (2)

MISCELLANEOUS
20 KVA. Taylor Spot Welders
3' Carleton Radial Drill
3' American Radial Drill
5' Cinc. Bickford Radial Drill
No. 1 Foote-Burt Duplex Surface Broach
8" Weiland Standard Pipe Machine
No. 4 Hilles & Jones Double End Punch and Shear
2" Acme Bolt Threader
No. 1 Baker Keyseater

WIGGLESWORTH MACHINERY COMPANY
203 Bent St., Cambridge, Mass.

No. 3 Acme Universal Turret Lathe. Grd Head. Arranged for Chucking.
21" Model H Gisholt Turret Lathe.
14 ga x 8' OHL power Squaring Shear.
4 & 6 Spindle Avery Sensitive Drills No. 2 M.T., B.B.
No. 1B, No. 2B Edlund, 2 Spindle Sensitive Drills
16"x66" Landis Universal Grinder. Overhead belt drive
24"x24" Ohio Planer, 1 head, belted moto. drive.
18"x9' Chard Lathe semi quick change cone.
10' Robinson Toggle Type Press Brake
No. 12, 13 Natco Drills

IROQUOIS MACHINERY CO.
662 Ohio St. Buffalo, N. Y.

500# B & S Board Drop Hammer.
800# B & S Board Drop Hammer.
18"x12' Hendey Grd. Hd., T.A.
42"x20' N.H. Geared Head Lathe, M.D.
5' American Radial, Semi-Universal, B.D.
39"x36"x12' Cin. Planer, 2 Heads.
26" S. & M. B.G. Shaper B.D.
#59¼ Toledo Press 12" Stroke.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
Bolt Cutters 1"x1½"-2"-3"-4" Acme.
WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

GRINDERS
LANDIS 10x36" 12"x36" Self-Cont.. M.D.
MODERN 12x24", 12"x42", M.D.
LANDIS No. 3 Universal, 16x52"
CINCINNATI 8x18" M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N. Y.

POWER PRESSES
BLISS, TOLEDO, V & O, ETC.
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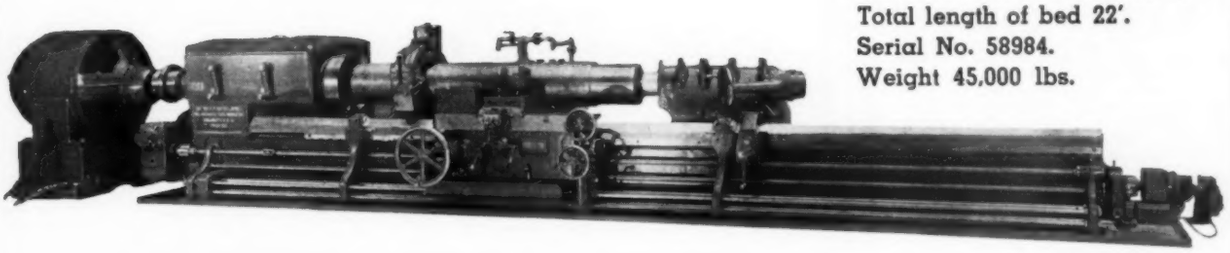
for bringing business needs or "opportunities" to the attention of men associated in administrative, executive, management, sales and responsible technical, engineering and operating capacities with the industries served by McGraw-Hill publications.

Departmental Staff: McGraw-Hill Publishing Co., 330 W. 42nd St., New York City

22" AMERICAN 100 H. P. INPUT SUPER LATHE

Swing over shears 22½".
Distance between centers 16'.
Total length of bed 22'.
Serial No. 58984.
Weight 45,000 lbs.



Electrical equipment—100 H.P. main drive motor and 4 other motors. All motors 230 volt, direct current.

140 spindle speeds from 33 to 1200 RPM.

A super-powered, super-capacitied lathe, designed to obtain the maximum metal cutting capacities of cemented carbide cutting tools. Equipped with anti-friction bearings throughout, hardened and lapped helical gears in headstock, apron control, chip breaker, chip conveyor and many special features. Designed for extra heavy work, especially the turning of forgings.

THE EASTERN MACHINERY CO.

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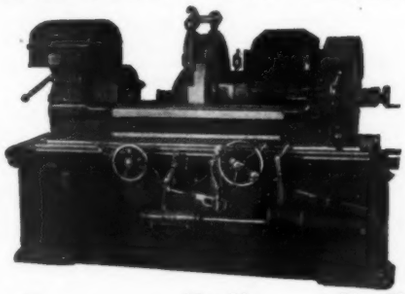
HILL-CLARKE MOTOR DRIVEN GRINDERS



SIZES

10 x 36	14 x 36	14 x 96
10 x 50	14 x 50	16 x 50
10 x 72	14 x 72	16 x 72

HILL-CLARKE MACHINERY CO.
651 WASHINGTON BLVD. CHICAGO

HIGH GRADE MACHINE TOOLS

LATHES

14"x6' Hendey Grd. Hd. S.P.D. T.A.
16"x8' South Bend Cone Drive, Q.C.
20"x8' American High Duty Cone, Q.C.
18"x8' LeBlond Cone, B.G.
18"x8' Greaves Klusman Grd. Hd. T.A. Q.C.
20"x17' Greaves Klusman Grd. Hd. T.A. Q.C.
20"x8' American Grd. Hd. M.D.
25"x16' LeBlond H.D. 3 S.C.D. D.B.G.
36"x20' Fifield Engine Lathe, Cone Drive.

GRINDERS

#55 Heald Internal Grinder, Belt driven.
12" Pratt & Whitney Surface Grinder, B.D.
14"x72" Queen City Self Contained Plain.
60"x60"x12' Pond H.D. 4 hds.
#5 Oliver Drill Grinder, Motor Driven.

GEAR CUTTERS

#3-26" B & S Gear Cutter.
#1 and 3 Adams Gear Hobbers.

BORING MILLS

42" Niles Bement Pond, H.D.

BOLT & PIPE THREADERS

2" Landis with Lead Screw Cone drive.
3" Landis Cone drive.
1" Acme Cone drive.
2" Landis Pipe Machine Cone drive.
2" Acme Cone drive.

RADIAL & UPRIGHT DRILLS

4'x6' Bickford Plain S.P.D.
20" Barnes 4 spindle drill.
26" Barnes All geared Tapping attachment.

SHAPERS & PLANERS

24" Rockford H.D. Back Geared Crank.
24" Steptoe H.D. Back Geared Crank.

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217 East Second St. Cincinnati, Ohio

1—No. 2B **Hendey Universal Mill**, M.D.
1—No. 4 **Brown & Sharpe Plain Mill**, M.D.
1—No. 4 **Becker Vertical Milling Machine**
3—9" **Porter Cable Mfg. Lathes**, M.D.
1—No. 3 **Toledo Back-Geared Press**, M.D.
1—No. 3 **American Broaching Machine**
1—18" **Libbey Turret Lathe**
1—No. 17 **Barber-Colman Gear Hobber**
2—15" **Gleason Pinion Roughers**
11—1" **Landis Threader**
1—No. 12 **Natco 16 Spindle Drill**

Your inquiries receive prompt attention

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Adams 1914

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AUTOMATICS, B. & S. #00 Cutoff
AUTOMATICS, Cleveland ⅞—1 1/16" Model M
AUTOMATICS, Cleveland, ⅝—⅞ & ⅞—1¼" Model A
AUTOMATICS, Gridley, 2¼ & 3¼" S.S.
BORING MILLS, Bullard, 42" 2 Swivel Heads
GRINDERS, B. & S. #16 Plain
GRINDERS, Norton, 10x24 & 36" Plain
LAPPER, Norton #10U & 15 Vertical, M D.
MILLING MACHINES, Becker Vertical, #4B.
PLANERS, 30x30x8' Ctl-44x44x18' Niles
PRESSES, Toledo, #34 & 35 Solid Back, S.G.
PRESSES, Ferracute, P2, 3 & 4, Solid Back
ROLLS, Bertsch 6'x¼" M.D.
SHEARS, Robinson ,8'x14 gauge, M.D.

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542 Second Ave. Detroit, Mich.

5—Watson-Stillman 200-ton Semi-Automatic Molding Presses.
1—Watson-Stillman Hydro-Pneumatic Accumulator for above Presses.
1—Watson-Stillman Horizontal Pump for above, M. D.

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New and Used Machine Tools
47 Laurelton Road Rochester, N. Y.

...IN STOCK

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2½" Model A Cleveland, single spindle
No. 55 National Acme four spindle
No. 53 National Acme four spindle
No. 52 National Acme four spindle
1¼" Model F Gridley, four spindle
¾" Model F. Gridley, four spindle
⅞" Model F Gridley, four spindle

BROACHES

No. 3 LaPointe
Hercules 15 ton vertical

DRILLS

No. 25 Foote Burt
24" Kern
24" Cincinnati
3 Spindle Henry & Wright
4 Spindle Rockford
No. 12 Natco Multiple Spindle
No. 13 Natco Multiple Spindle
Three Way Natco Horizontal Multiple Spindle

GEAR CUTTERS

No. 10 Lees-Bradner Gear Grinder
15" Gleason Spiral Bevel Generator
18" Gleason Gear Tester
No. 2 Pfauter
No. 61 Fellows

GRINDERS

No. 55 Heald Internal
No. 60 Heald Internal
No. 2 Diamond Surface
22"x84" Pratt & Whitney Surface
6x32 Norton Cylindrical
10x30 Landis Cylindrical
12x36 Modern Cylindrical
16"x50" Norton Crankshaft
No. 3 Modern Universal

LATHES

13"x6' Willard, c.d. s.q.c.
14"x6' Monarch, c.d.
16"x6' Lodge & Shipley, c.d.
18"x6' Lodge & Shipley, c.d.
18"x8' Monarch, c.d.
20"x10' Lodge & Shipley, q.h.
21"x8' LeBlond. c.d.
31½"x60" Fitchburg Lo-Swing, q.h.
18"x7' Chard Production, c.d.

TURRET LATHES

No. 3 Wood
No. 3 Foster, q.h.
21" Steinle
No. 2A Warner & Swasey
No. 1 Warner & Swasey
2¼x24 Jones & Lamson

MILLS, PLAIN

No. 3 Cincinnati, c.d.
No. 2M Cincinnati, rect. o.d. motor in base
No. 14A Garvin, c.d.
No. 7 Becker, Lincoln Type
No. 4 Hendey, Lincoln Type
Vulcan, Hand

MILLS, VERTICAL

No. 2M Cincinnati Motor in Base

PLANERS

26"x26"x8' Gray
30"x30"x8' Cincinnati
33"x33"x10' Cincinnati

SAWS

No. 4 Atkins Band, m.d.
6x6 Peerless Universal Shaping

SHAPERS

16" American c.d.
24" Smith & Mills, c.d.

TAPPERS

No. 2X Garvin
½" Rickert Shafer, Radial

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1959-69 South Meridian Street
INDIANAPOLIS, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

For Immediate Delivery...

5,000 doz. H.S. Jobbers Drills and H.S. wire Gauge Drills

10,000 doz. C.S. Machine Screw and hand machinist taps U.S.S. and S.A.E. All Best American Manufacture

Send us your inquiries for independent and Universal lathe chucks

We may have what you want for immediate delivery —
If you have no need for tools —
Buy U.S. "Attack Now" Bonds anyhow.

DEWITT TOOL CO.

173 Grand St. New York City

UNUSUAL VALUES

Shapers: 24" G&E.
28"x20'6" **Rahn-Carpenter Lathe** 14' between centers
24"x16' **Greaves & Klusman**
Briggs Type A Milling Machine
Presses: #48 Niagara, #16 J. M. Robinson ¾" capacity Rock River punch and shear
Broaching Machines, LaPointe, #1, #3
Drill Presses: 28", 24" Hoefer; 25", 20", 40" Bement
Ceiling Suspended Drill Unlimited drilling area
2 50# **Bradley upright hammers,** m.d. like new
Radial Drills: 5' Bausch
Miller: 20"x24"x18" Ingersoll
Grinders: #20 Bryant Internal
300 other machinery items
MOTORS—new 5 H.P. for 3-phase, ball brg. $55.75

Other sizes equally low priced. Also rebuilt motors.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

ST. LOUIS' Headquarters FOR GOOD USED TOOLS, OFFERS:

GOULD & EBERHARDT 24", S.P. Shaper
BULLARD 51" Vert. Boring Mill
MUELLER 4½' Gear Box Drive Radial Drill
AMERICAN 34"x18' Q.C.G. M.D. Lathe
BARNES 4-S.P. Grd. Camel Back Drill
HENDEY 16"x18' Q.C.G. Lathe
CINCINNATI # 1-M S.P.D. Pl. Miller
NEWTON Vert. Miller 47" Rot. Table
INGERSOLL 2—SP. Vert. Miller
B&S 48"x10" #4 Gear Cutter
FELLOWS #3 Gear Shaper

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Let Us Quote On All Machinery Needs

McDONALD MACHINERY CO.
1531-35 N. Broadway St. Louis, Mo.

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TROLLEY
100 miles—3/0 Copper, bare.
90 miles—4/0 Copper, bare.
TRANSMISSION
257 miles—#2 Hard drawn Copper, bare.
DISTRIBUTION
185 miles—4/0 Copper, bare.
3 miles—500,000 CM. Copper, bare.
ALSO — 4/0 & 3/0 INSULATED WIRE

for Better Used Equipment
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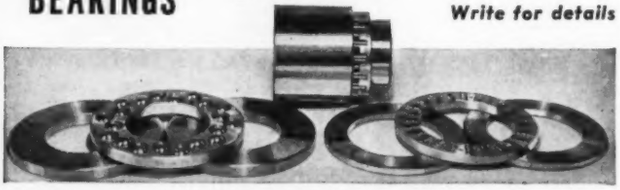

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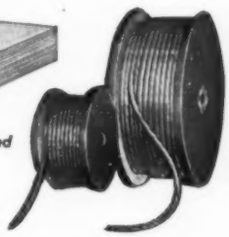

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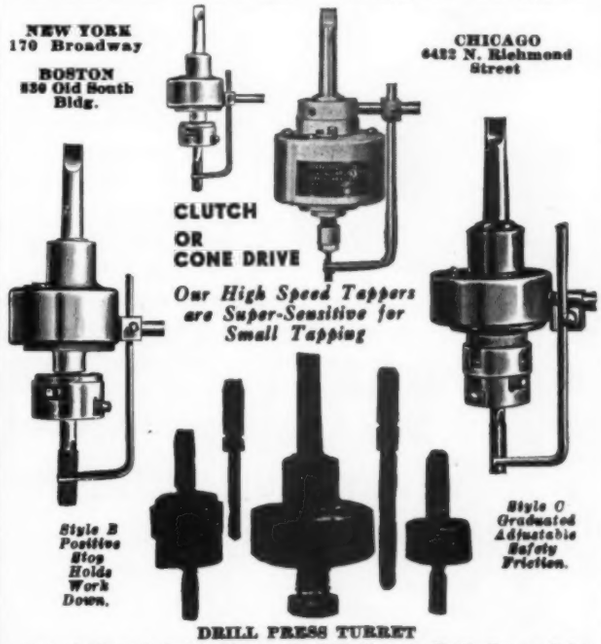

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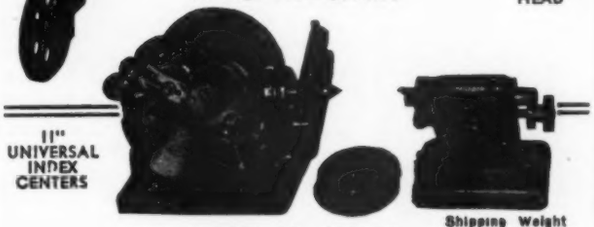

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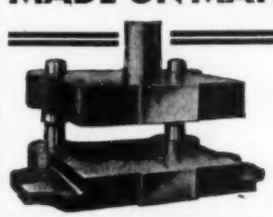

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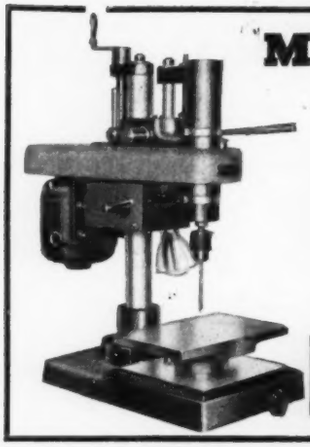

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Davis & Thompson Co., Milwaukee
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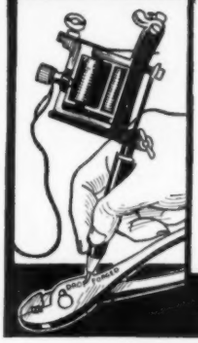

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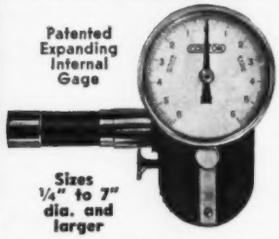

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Request Bulletin 27

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Greenfield Tap & Die Corp., Greenfield, Mass.
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Scherr Co., George, N. Y. C.

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Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Taper
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Perkins Mach. & Gear Co., Springfield, Mass.
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Bilgram Gear & Machine Works, Philadelphia, Pa.
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Cincinnati Gear Co., Cincinnati, Ohio.
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Meisel Press Mfg. Co., Boston, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
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Braun Gear Corp., Brooklyn, N. Y.
General Electric Co., Schenectady, N. Y.
Perkins Mach. & Gear Co., Springfield, Mass.
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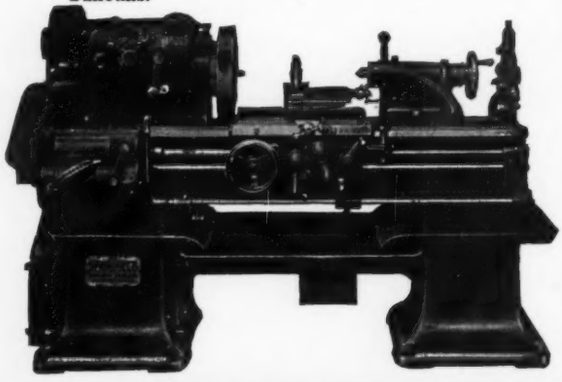

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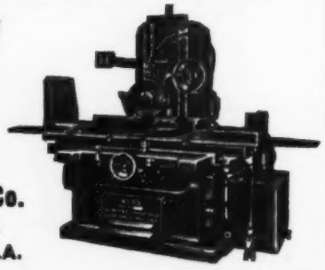

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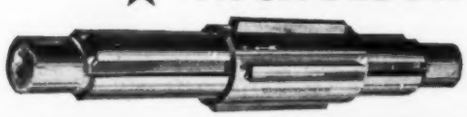

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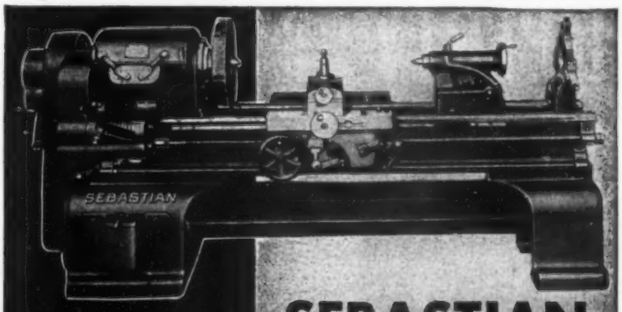

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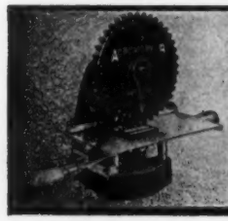

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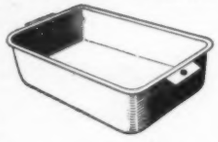

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Harnischfeger Corp., Milwaukee
Wesche Electric Co., B. A., Cincinnati.

MOTORS, Fractional-HP
General Electric Co., Schenectady, N. Y.

MOTORS, Integral-HP
General Electric Co., Schenectady, N. Y.

MOULDS, Lead Hammer
Johnson Tool Co., East Providence, R. I.

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Stuart Oil Co., D. A., Chicago, Ill.

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Salem Tool Co., Salem, Ohio.

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Walker Co., O. S., Worcester, Mass.

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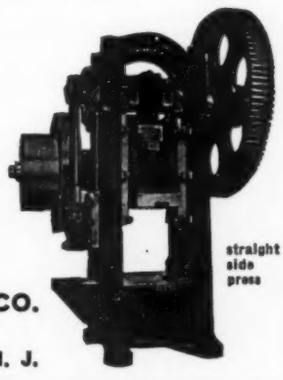

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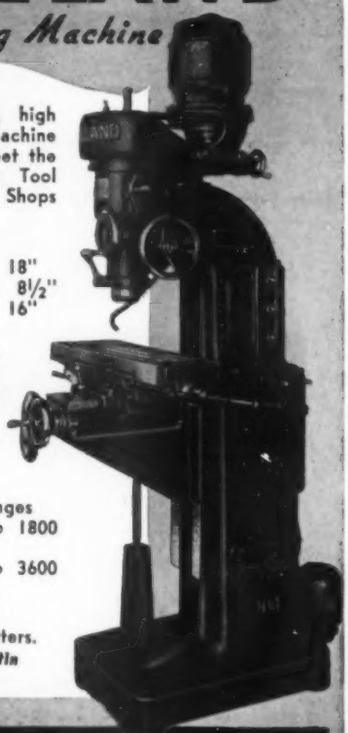

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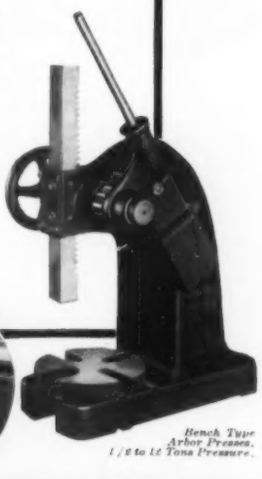

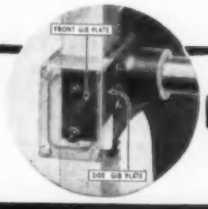

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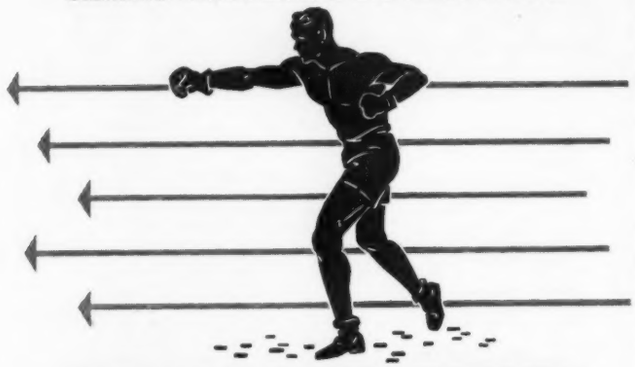

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SAWS, Hack
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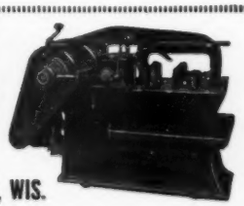

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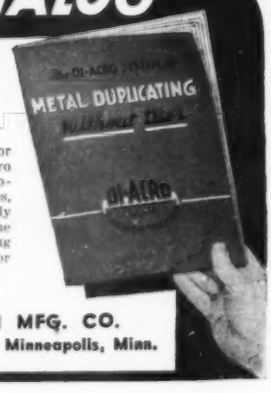

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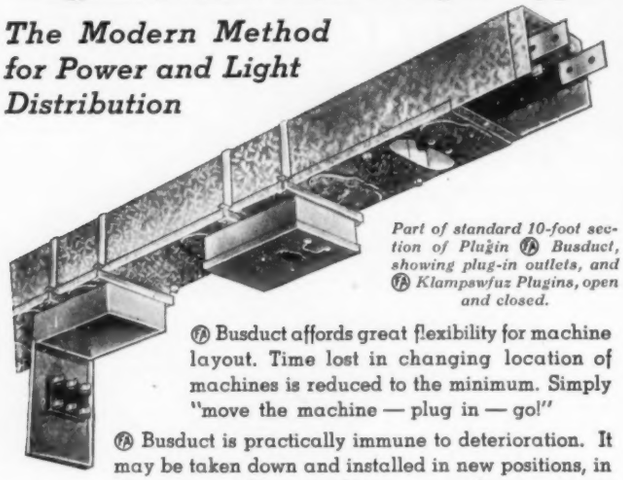

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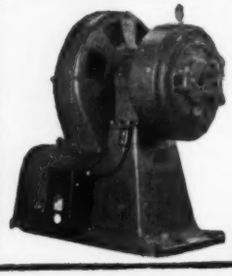

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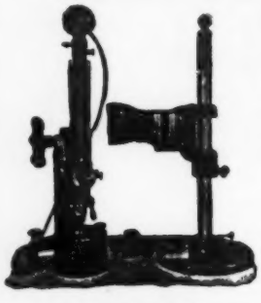

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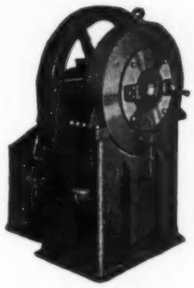

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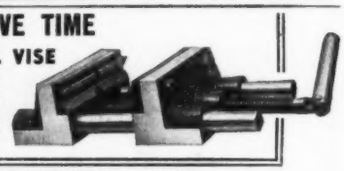

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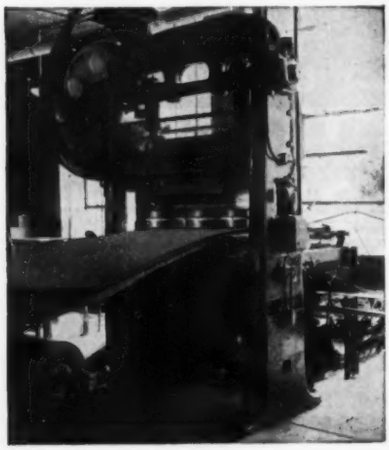

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Abrasive Machine Tool Co. 137
Acromark Corp. 140
Adam Electric Co., Frank 144
Adams Company 82
Advance Machine Works 132
Air Reduction Sales Co. 62
Allegheny Ludlum Steel Corp. (Ed.) .. 304
Allen Manufacturing Co. 78
Allis-Chalmers Mfg. Co. 21
American Chain & Cable Co., Inc. .112, 117
American Tool Works Co. 16
Ames Co., B. C. 116
Apex Tool & Cutter Co. 132
Armstrong-Blum Mfg. Co. 93
Armstrong Bros. Tool Co. 17
Atlantic Machinery Corp. 54
Auto-Ordnance Corp. 98
Avey Drilling Machine Co., Inc. 135
Bakelite Corp. 76, 77
Baldwin-Southwark Div., Baldwin Locomotive Works 113
Ball & Roller Bearing Co. 130
Barber-Colman Co. 34
Bardons & Oliver, Inc. 87
Barnes Drill Co. 134
Barrett Co., Leon J. 78
Baumbach Mfg. Co., E. A. 133
Bayard & Co., Inc., M. L. 118
Behr-Manning Corp. 100
Bilgram Gear & Machine Works 79
Bissett Steel Co. 146
Blanchard Machine Co. 38
Bradford Machine Tool Co. 99
Braun Gear Corp. 79
Bridgeport Safety Emery Wheel Co. .. 132
Brown & Sharpe Mfg. Co. 83
Bryant Chucking Grinder Co. 18, 19
Bullard Company 43
Burke Machine Tool Co. 140
Campbell, Andrew C., Div. American Chain & Cable Co., Inc. 117
Carboloy Co., Inc. (Ed.) 309
Card Mfg. Co., S. W. (Div. Union Twist Drill Co.) 106
Carlton Machine Tool Co. 134
Carnegie-Illinois Steel Corp. 46, 47
Carpenter Steel Co. 24, 25
Cincinnati Bickford Tool Co. 55
Cincinnati Gear Co. 81
Cincinnati Grinders Incorporated ...10, 11
Cincinnati Milling Machine Co. 4, 5
Cincinnati Planer Co. 58
Clearing Machine Corp. 142
Cleveland Pneumatic Tool Co. 74
Cleveland Twist Drill Co. 107
Climax Molybdenum Co. (Ed.) 317
Columbia Steel Co. 46, 47
Columbus McKinnon Chain Corp. 88
Comtor Co. 136
Cone Automatic Machine Co., Inc. .. 28
Consolidated Machine Tool Corp. 53
Coulter Machine Co., James 91
Crafts & Co., Inc., Arthur A. 132
Danly Machine Specialties, Inc. 132
Davis Keyseater Co. 138
Desmond-Stephan Mfg. Co. 133
Detroit Tap & Tool Co. (Ed.) 311
Diamond Tool Co. 146
Dinhofer Corp. 48d
Douglas Machinery Co., Inc. 137
Earle Gear & Machine Co. 79
Eastern Machine Screw Co. 132
Electric Furnace Co. 135
Errington Mechanical Laboratory 131
Etna Machine Co. 144
Excello Corp. 39
Famco Machine Co. 141
Fellows Gear Shaper Co. 8, 9
Fenn Mfg. Co. 40
Firth-Sterling Steel Co. 42
Ford Chain Block, Div. American Chain & Cable Co., Inc. 112
Fosdick Machine Tool Co. 48a
Frav Machine Tool Co. 130
Gallmeyer & Livingston Co. 138
Ganschow Gear Co. 136
Gear Specialties, Inc. 82
General Electric Co. 32, 33, 85
General Machinery Corp. (Mass.) 137
General Machinery Corp. (Ohio) 44
Geometric Tool Co. 145
Gisholt Machine Co. 49, 51
Gleason Works 3
Gorton Machine Co., George 101
Goss & de Leeuw Machine Co. 92
Grant Gear Works 82
Grant Mfg. & Machine Co. 143
Gray & Prior Machine Co. 146
Greenfield Tap & Die Corp. 50
Gulf Oil Corp. 64, 65
Hamilton Tool Co. 134
Hammond Machinery Builders, Inc. .. 137
Hardinge Brothers, Inc. 37
Harnischfeger Corp. 60
Hartford Special Machinery Co. ..79, 106
Haskins Co., R. G. 117
Haynes Stellite Co. Div. Union Carbide & Carbon Co. 95
Heald Machine Co. .....2nd Cover
Hobart Bros. Co. 147
Holman Reamer Co. 142
Hones, Inc., Chas. A. 134
Hooven, Owens, Rentschler Co. 44
Hydraulic Press Mfg. Co. 115
Johnson Machine Co., Carlyle 81
Johnson Tool Co. 146
Jones & Lamson Machine Co. 6, 7
Kearney & Trecker Corp. 30, 31
Kempsmith Machine Co. 45
Kent-Owens Machine Co. 111
Kingsbury Machine Tool Corp. 48
Knight Machinery Co., W. B. 140
L. W. Chuck Co. 133
Landis Machine Co. 14, 15
Landis Tool Co. 36
LeBlond Machine Tool Co., R. K. 27
Lees-Bradner Co. 52
Leland Gifford Co. 134
Liberty Planers, Inc. 140
Linley Brothers Co. 130
Lipe-Rollway Corp. 97
Lodge & Shipley Machine Tool Co. .. 48c
Lombard Governor Corp. 90, 91
Lovejoy Tool Co., Inc. 109
Lucas Machine Tool Co. 131
McGraw-Hill Book Co., Inc. 96, 100, 112, 114, 147
McKenna Metals Co. 96
Machinery Mfg. Co. 108
Masonite Corp. 61
Meisel Press Mfg. Co. 82
Metal Carbides Corp. 130
Midwest Abrasive Co. 103
Millholland Machinery Co., W. K. 138
Mitts & Merrill 138
Monarch Machine Tool Co. 22, 23
Moore Mfg. Co., Wm. 135
Morey Machinery Co., Inc. 94, 102, 118, 143
Morris Machine Tool Co. 48b
Morse Chain Co. 84
Morse Twist Drill & Machine Co. .. 68
Murchey Machine & Tool Co. 146
National Machine Tool Co. 139
National Twist Drill & Tool Co. 75
Newark Gear Cutting Machine Co. ... 82
New Britain-Gridley Div. New Britain Machine Co. .....3rd Cover
Nichols & Sons, W. H. 110
Nicholson & Co., W. H. 139
Niles Tool Works Co. 44
Oakite Products Inc. 114
Oliver Instrument Co. 133
O'Neil Irwin Mfg. Co. 143
Oster Mfg. Co. 67
Peerless Machine Co. 71
Perkins Machine & Gear Co. 79
Philadelphia Gear Works 80
Phosphor Bronze Smelting Co. 131
Pioneer Engineering & Mfg. Co. (Ed.) 320
Porter-McLeod Mach. Tool Co., Inc. .. 110
Portman Machine Tool Co. 140
Potter & Johnston Machine Co. 41
Pratt & Whitney Div. Niles-Bement-Pond Co. 35
Production Machine Co. 135
Producto Machine Co. 133
Queen City Machine Tool Co. 102
Racine Tool & Machine Co. 143
Randall & Stickney 135
Ready Tool Co. 145
Reed-Prentice Corp. .....(Ed.) 302
Revere Copper & Brass, Inc. ....(Ed) 315
Rivett Lathe & Grinder, Inc. 114
Roberts Rubber Co., Weldon 73
Roller Bearing Co. of America 88
Ruthman Machinery Co. 142
Ryerson & Sons, Inc., Jos. T. ....(Ed) 319
Salem Tool Co. 140
Schatz Mfg. Co. 70
Scherr Co., Inc., George 108
Scully Jones & Co. 89
Sebastian Lathe Co. 139
Sellers & Co., Inc., Wm. 66
Sheldon Machine Co., Inc. 102
Shore Instrument & Mfg. Co. 144
Simmons Machine Tool Corp. 26
Sisalkraft Co. 63
Smith & Mills Co. 143
Sommer & Adams Co. 141
South Bend Lathe Works 29
Springfield Machine Tool Co. 138
Stahl Gear & Machine Co. 81
Standard Conveyor Co. 59
Standard Pressed Steel Co. 72
Stuart Oil Co., D. A. .....(Ed) 320
Sturdimatic Tool Co. 92
Sun Oil Co. .....(Ed) 307
Swiss American Gear Mfg. Co. 81
Timken Roller Bearing Co. .....4th Cover
Torrington Co. .....(Ed) 313, 145
Union Carbide & Carbon Corp. 76, 77, 95
Union Twist Drill Co. 20
U. S. Steel Corp. 46, 47
U. S. Steel Export Co. 46, 47
Universal Engineering Co. 116
V & O Press Co., Inc. 142
Van Norman Machine Tool Co. ...12, 13
Vascoloy-Ramet Corp. 145
Vitrified Wheel Co. 98
Vonnegut Moulder Corp. 136
Walker Co., Inc., O. S. 90
Walls Sales Corp. 136
Waltham Machine Works 118
Warner & Swasey Co. 56
Waterbury Steel Ball Co. 116
Wesche Electric Co., B. A. 86
Wilson Mechanical Inst. Co., Inc. ... 145
Wyckoff Drawn Steel Co. 69
Zeh & Hahnemann Co. 141

SEARCHLIGHT SECTION

Classified Advertising

Classification	*Page*
BOOKS	121
Audel, Publishers	121
CONTRACT WORK SECTION	119-120
The Abbott Ball Company	119
Bay City Forge Co.	120
Brad Foote Gear Works	119
Eastern Tool & Mfg. Co.	120
Fidelity Machine Co.	119
General Pattern Works	119
Greist Mfg. Co.	119
Holmes & Bros., Inc., Robert	119
Kirk & Blum Mfg. Co.	119
Nashua Pattern & Model Co.	120
Nilson Machine Co., A. H.	119
Old Colony Engineering Co.	119
Reed Machine & Tool Engineers	119
Thomas & Skinner Steel Prods. Co.	119
PATENT ATTORNEY	121
BUSINESS OPPORTUNITIES	121
POSITIONS VACANT	121
POSITIONS WANTED	121
PROFESSIONAL SERVICES	121
SELLING OPPORTUNITIES	121
USED SURPLUS EQUIPMENT	121-129
Aaron Machinery Co.	126
Adelphia Equipment Co.	121
Atlantic Machinery Corp.	122
Central Machine Tool Corp.	127
Cincinnati Machinery & Supply Co.	127
De Witt Tool Co.	128
Dony Machinery Co., D. E.	127
Dulien Steel Products, Inc.	128
Eastern Machinery Co.	127
Emerman & Co., Louis E.	126
Falk Machinery Co.	124-125
Hill-Clark Machinery Co.	127-129
Hyman & Son, Joseph	126
Indianapolis Machy. & Supply Co., Inc.	128
Industrial Pipe & Fillings Co.	128
Iroquois Machy. Co.	126
Jones Machine Tool Co.	126
Lang Machy. Co.	129
McDonald Machinery Co.	128
Miles Machinery Co.	126
Modern Collet and Machine Co.	121
Nuttall, J.	128
O'Brien Machy. Co.	129
Osborne & Sexton Machinery Co.	128
Ott Machinery Sales, Inc.	127
Reconstruction Machine Tool Corp.	129
Rosenkranz Machinery Co.	128
S & S Machinery Co.	121
Simmons Machine Tool Corp.	123
Strong Carlisle & Hammond Co.	129
West Penn Machinery Co.	126
Wigglesworth Machinery Co.	126
Wigglesworth & Co., T. P.	128
Zeeve & Co., Alex.	121

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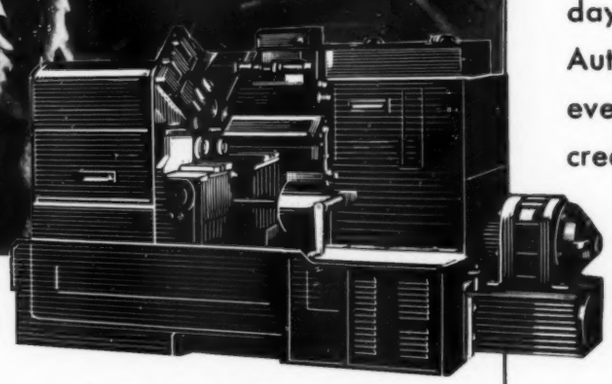

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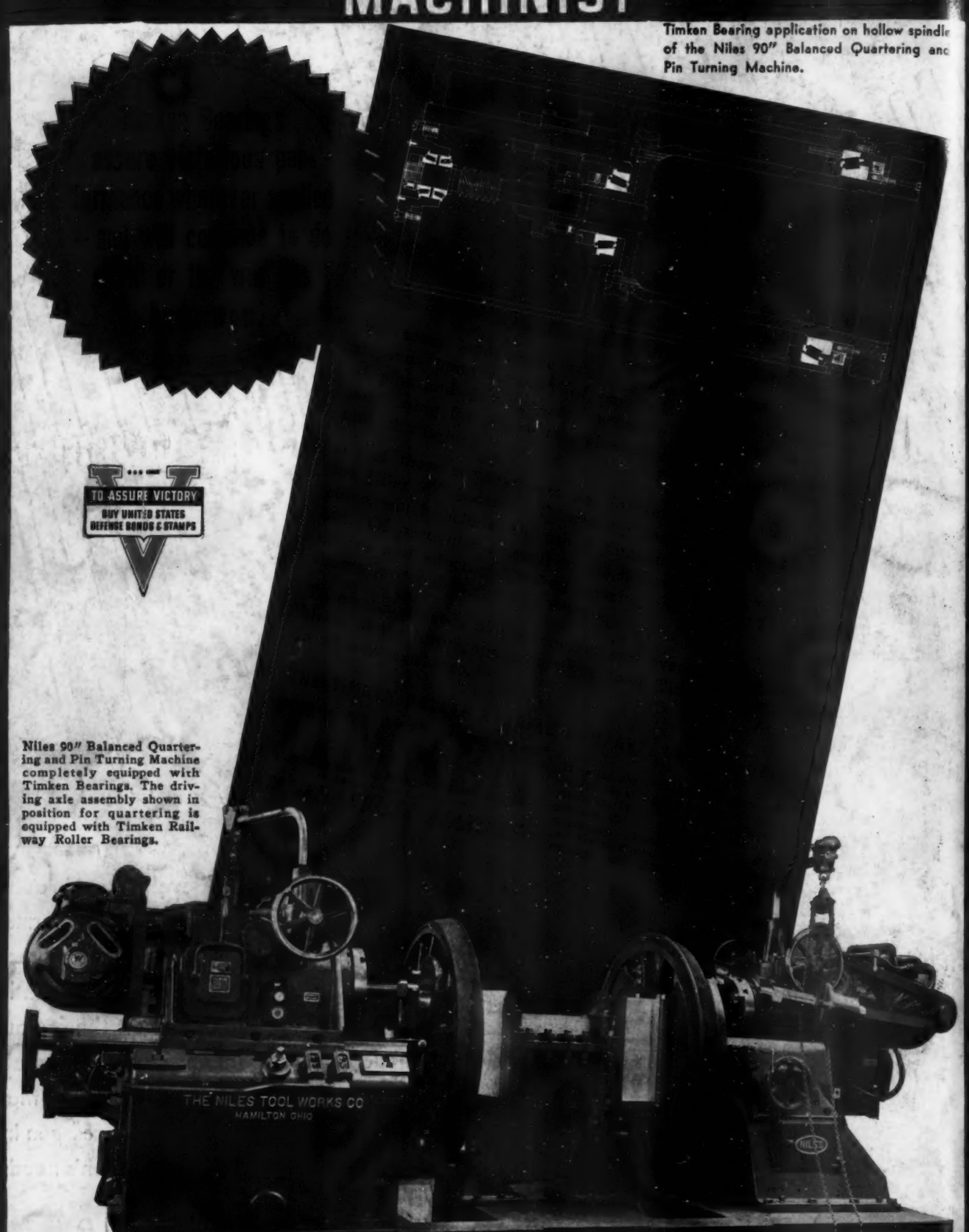

Timken Bearing application on hollow spindle of the Niles 90" Balanced Quartering and Pin Turning Machine.

Niles 90" Balanced Quartering and Pin Turning Machine completely equipped with Timken Bearings. The driving axle assembly shown in position for quartering is equipped with Timken Railway Roller Bearings.